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THE PRAIRIE CREEK EMBAYMENT AND LOWER PALEOZOIC STRATA OF THE SOUTHERN MACKENZIE MOUNTAINS

D.W. Morrow
D.G. Cook

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Editor

E.J.W. Irish

Technical editor

E.G. Snow

Word processing

P.L. Greener
M.L. Varalta

Authors' address

Institute of Sedimentary and Petroleum Geology
3303 - 33rd Street N.W.
Calgary, Alberta T2L 2A7

Artwork by CARTOGRAPHY UNIT
Institute of Sedimentary and Petroleum Geology

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PREFACE

The Ordovician to Devonian sequence in the southern Mackenzie Mountains region records the development of an early Paleozoic depositional shelf edge margin where shallow water carbonates passed abruptly basinward to deeper water argillaceous sediments. The migration of this shelf edge was related to the evolution of Root Basin, an intrashelf basin that occupied the southern Mackenzie Shelf, and to the development of the Prairie Creek Embayment at the southern entrance of Root Basin. The greater precision in the stratigraphic analysis afforded by this study has led to a more exact characterization of the stratigraphic and structural setting of the Cadillac mineral deposit (Pb-Zn-Ag) and of other related mineral showings in the region of Root Basin and Prairie Creek Embayment.

The exposed early Paleozoic shelf carbonate sequence of this area, like its counterpart in the southern Rocky Mountains, has provided the opportunity for the examination of rocks that correlate with nearby hydrocarbon-bearing subsurface strata. Surface exposures of the Manetoe dolomite reservoir facies have provided important clues to the origin of the Kotaneelee and Pointed Mountain gas fields which are Canada's northernmost producing gas fields.

In addition to providing the basis for the understanding of mineral and hydrocarbon resources of this area, the present study contributes to our appreciation of the variety of depositional shelf-to-basin transition styles which serve as models for use in petroleum and mineral exploration. Finally, this report will enhance the pleasure of Canadians and other persons who visit Nahanni National Park where the Ordovician to Devonian sequence of the Mackenzie Mountains is spectacularly exposed along the canyon walls of the South Nahanni River.

R.A. Price
Director General
Geological Survey of Canada

PRÉFACE

Les séquence ordovicienne-dévonienne des monts Mackenzie du sud témoigne le développement d'une marge de rebord du plateau datant du Paléozoïque inférieur où des carbonates d'eau peu profonde cèdent brusquement vers le bassin aux sédiments argileux d'eau profonde. La migration de cette marge de rebord du plateau était liée à l'évolution du bassin de Root (ce dernier étant un bassin d'intra-plateau situé dans le plateau Mackenzie du sud) et au développement de la baie de Prairie Creek à l'entrée sud du bassin de Root. Grâce à la présente étude, une analyse stratigraphique plus précise nous accorde une description plus exacte de la mise en place stratigraphique et structurelle du gisement minéral de Cadillac (de plomb-zinc-or) et des auréoles d'autres minéraux associés dans la région du bassin de Root et de la baie de Prairie Creek.

La présence de cette séquence carbonatée de plateau datant du Paléozoïque inférieur et dénudée dans cette région, comme des séquences semblables localisées dans les Montagnes Rocheuses au sud, nous donne l'occasion d'examiner des roches qui corrélent avec des strates de subsurface tout proche et qui renferment des hydrocarbures. Les affleurements de surface du faciès de réservoir de la dolomie de Manetoe nous offrent des indices relatifs à l'origine des champs de gaz naturel de Kotaneelee et de Pointed Mountain, ce qui figurent parmi des champs de gaz naturel producteurs au Canada de l'extrême nord.

En plus de donner une base à la compréhension des ressources en hydrocarbures et en minéraux de cette région, la présente étude sert à approfondir notre appréciation de la variété des modes de transition des zones continentales aux zones de socle le long de la Cordillère canadienne. De telles analyses servent de modèles à l'exploration et à l'évaluation futures des ressources en minéraux et en hydrocarbures. En dernier lieu, la lecture de ce rapport ajoutera au plaisir tant des Canadiens que des étrangers qui rendent visite au parc national Nahanni où la séquence ordovicienne-dévonienne des monts Mackenzie se voit affleuré spectaculairement le long des murs de la gorge de la rivière South Nahanni.

R.A. Price
Directeur général
Commission géologique du Canada

CONTENTS

1 Abstract/Résumé
2 Summary
3 Sommaire

5 CHAPTER I
5 Introduction
6 Present work
6 Acknowledgments
6 Influence of physiography
6 Access
6 Previous work
8 Regional setting
10 Major stratigraphic subdivisions and relationships

14 CHAPTER II
14 Sunblood Platform
14 Introduction
14 Sunblood Formation
14 Introduction
14 Lithology, distribution and thickness
14 Contact relationships, age and correlation
18 The Mount Kindle-Root River assemblage
18 Introduction
18 Mount Kindle Formation
18 Whittaker Formation
18 Introduction
19 Lithology, distribution and thickness
22 Contact relationship, age and correlation
22 Road River Formation
22 Introduction
23 Lithology, sedimentary structures, distribution and thickness
25 Contact relationships, age, correlation
28 Root River Formation (new name) and Silurian-Devonian undivided
28 Introduction - the stratigraphic problem of the Delorme
28 Lithology, sedimentary structures, distribution and thickness
29 Contact relationships, age and correlation
31 Depositional and tectonic summary of the Mount Kindle-Root River assemblage

35 CHAPTER III
35 The Prairie Creek assemblage
35 Introduction
35 The lower Cadillac phase of the Prairie Creek assemblage
35 Cadillac Formation (new name)
35 Introduction
39 Lithology, sedimentary structures, distribution and thickness
39 Orange siltstone member
41 Megabreccia member
41 Pink shale member
41 Thickness data
43 Contact relationships, age and correlation
44 Vera Formation (new name)
44 Introduction
44 Lithology, sedimentary structures, distribution and thickness
45 Contact relationships, age and correlation
46 Camsell Formation [Corridor Member (new name)]
46 Introduction
47 Lithology, sedimentary structures, distribution and thickness
47 Dolostone-siltstone facies
47 Limestone-sandstone facies
48 Anhydrite-siltstone facies
48 Statistical data concerning lithologic variations
50 Thickness data
50 Contact relationships, age and correlation

51 Depositional and tectonic summary of the Lower Cadillac phase of the Prairie Creek assemblage
54 The Upper Cadillac phase of the Prairie Creek assemblage
54 Sombre Formation
54 Introduction
54 Lithology, sedimentary structures, distribution and thickness
54 Sombre Formation (shelf facies)
56 Detrital member
57 Contact relationships, age, correlation and faunas
60 Arnica Formation
60 Introduction
60 Lithology, sedimentary structures, distribution and thickness
60 Arnica Formation (shelf facies)
63 Basinal member
64 Contact relationships, age, correlation and faunas
68 Depositional and tectonic summary of the Upper Cadillac phase of the Prairie Creek assemblage

70 CHAPTER IV
70 The Funeral Headless assemblage
70 Introduction
70 The Funeral-Landry phase
70 Landry Formation
70 Introduction
72 Lithology, sedimentary structures, distribution and thickness
72 Contact relationships, age, correlation and faunas
73 Funeral Formation
73 Introduction
74 Lithology, sedimentary structures, distribution and thickness
75 Contact relationships, age, correlation and faunas
76 The Headless-Nahanni phase
76 Headless Formation
76 Introduction
76 Lithology, sedimentary structures, distribution and thickness
76 Contact relationships, age, correlation and faunas
77 Nahanni Formation
77 Introduction
77 Lithology, sedimentary structures, distribution and thickness
77 Contact relationships, age, correlation and faunas
78 Depositional and tectonic summary of the Funeral-Headless assemblage
79 The Manetoe facies dolomite - a diagenetic facies
83 Summary of the depositional history and implications for early Paleozoic tectonics and eustacy

85 CHAPTER V
85 Some aspects of structural development
85 Reverse faults
85 Thrust faults
85 Wrench movements
85 Economic geology
87 References
91 Appendix 1 - type and reference sections
117 Appendix 2 - faunal data
123 Appendix 3 - measured sections

Illustrations

Tables

8-9 1. Formation thickness
24 2. Chemical and mineralogical analyses
86 3. Lead isotope analyses (Cadillac deposit)

Figures

4 1. Index map of study area
5 2. Chart of stratigraphic nomenclature
7 3. Location of stratigraphic and well sections
11 4. Tectono-stratigraphic elements of the Mackenzie Arc
12-13 5. Stratigraphic cross-section of Ordovician strata in the Root River and Virginia Falls map areas
15 6. East-west correlation between the Mount Kindle and Whittaker formations
16-17 7. Stratigraphic cross-section of Silurian-Devonian strata in the Root River and Virginia Falls map areas
19 8. An index map of stratigraphic cross-section locations
20-21 9. Stratigraphic cross-section of Silurian-Devonian strata along the Tundra Range
22 10. North-south cross-section of Silurian-Devonian strata through the Prairie Creek Embayment
23 11. Stratigraphic cross-section of Silurian-Devonian strata across the Prairie Creek Embayment
25 12. Columnar sections of the Road River and Vera formations
26-27 13. Columnar sections of the stratigraphic sequence in the Prairie Creek Embayment
29 14. Intraformational scour surface in Road River Formation
30 15. Columnar sections of the Root River Formation and Corridor Member of the Camsel Formation
31 16. Dolostones of the Root River Formation
32 17. A stratigraphic mound in the Root River Formation
32 18. Root River Formation brachiopod
33 19. Three alternative correlations of the thick Silurian-Devonian Mackenzie Mountain sequence with the thin Nahanni Range sequence
34 20. A chronostratigraphic chart of the early Paleozoic sequence from the Interior Plains to the Virginia Falls map area
36 21. Paleogeography of the Mount Kindle-Root River assemblage and part of the Lower Cadillac phase of the Prairie Creek assemblage
37 22. Paleogeography of the Corridor Member of the Camsell Formation
38 23. Paleogeography of the Upper Cadillac phase (Sombre and Arnica formations, pink shale member)
39 24. Orange weathering outcrop of thin bedded sandstone in the orange siltstone member of the Cadillac Formation
39 25. Current rippled hand sample of fine grained sandstone from the megabreccia member of the Cadillac Formation
40 26. Burrowed bed in megabreccia member
40 27. Oligomictic carbonate turbidite in the orange siltstone member
40 28. Polished sample of turbidite shown in Figure 27
40 29. Crinoidal lime mudstone with load casts, in the megabreccia member
42 30. Crinoidal mud mounds in the megabreccia member
42 31. A closer view of mounds shown in Figure 30
43 32. A dolostone megabreccia body in the megabreccia member
44 33. A large block at the base of a megabreccia body in the megabreccia member
45 34. The upper part of the pink shale member and the lower part of the detrital member of the Sombre Formation in Section 6
46 35. Sample of a lime wackestone turbidite in the pink shale member
47 36. The yellow striped facies of the Vera Formation
48 37. Looking east at Tundra Ridge and the intertonguing between the Vera and Camsell formations
49 38. A frequency plot of lithologic interval thicknesses in the Corridor Member of Section 20
50 39. Cyclic, peritidal sequence in the Corridor Member
50 40. The Vera, Camsell and Sombre formations exposed in Section 16
51 41. Mudcracked beds in the Corridor Member
51 42. Finely laminated and ripple marked orange sandstone in the Corridor Member
52 43. Abundant *Planolites* type of infilled burrows in the limestone-sandstone facies of the Corridor Member
52 44. Brecciated dolomicrite in the limestone-sandstone facies of the Corridor Member
52-53 45. A single-step Markovian characterization of interbedded lithologies in the Corridor Member for Sections 16, 17, 20 and 21
54 46. Block diagram of paleogeography during deposition of the orange siltstone member
56 47. Columnar sections of the Sombre, Arnica, Landry and Headless formations and the Manetoe facies in the shelf sequence
57 48. Bimodal quartzarenite sandstone of the Sombre Formation

58	49.	Algal mat overfolds in dolomicrite or dololaminite of the Sombre Formation
58	50.	Outcrop of a peritidal sequence in the Sombre Formation
59	51.	Authigenic, hollow, prismatic quartz crystals in dolostone of the Arnica Formation
59	52.	Outcrop of oligomictic dolostone breccia in the Sombre Formation
60	53.	Panoramic view of the Manetoe and Arnica ranges showing the southward transition to the Prairie Creek Embayment
61	54.	Planar, lime packstone turbidite bed in the detrital member of the Sombre Formation
61	55.	A closer view of the bed shown in Figure 54
62	56.	A photomicrograph of lime mudchips in a turbidite from the detrital member
62	57.	Basal part of a crinoidal, mass flow deposit in the detrital member
63	58.	Distant view of intertonguing contact between Sombre and Arnica formations at First Canyon on the South Nahanni River
64	59.	An upright slump fold in the basinal member of the Arnica Formation
65	60.	A debris flow of tabular clasts in the basinal member
66	61.	Interfragment cement in the breccia shown in Figure 60
66	62.	A loose block of rudstone from a debris flow in the basinal member
66	63.	The distal end of a debris flow in the basinal member
66-67	64.	A cliff exposure of debris flow tongues extending from the Sombre Formation into the Road River Formation shales on the south Nahanni River
66-67	65.	A closer view of the megabreccia debris flows in Figure 64
68	66.	A block diagram of the Prairie Creek Embayment during deposition of the pink shale member and the detrital member
71	67.	Paleogeography during deposition of the Funeral-Landry phase
72	68.	Stratigraphic cross-section of the Funeral-Headless assemblage across the central part of the Virginia Falls map area
73	69.	Air photo view of Ram Plateau showing relationships between the Arnica, Landry, Funeral, Headless and Nahanni formations and the Manetoe facies
74	70.	Stratigraphic cross-section of the Funeral-Headless assemblage across the northern part of the Virginia Falls map area
75	71.	Panoramic view of the Funeral-Headless contact east of Tundra Ridge
75	72.	A nodular mass flow deposit in the Funeral Formation
79	73.	Outcrop of Landry Formation limestone and Manetoe facies dolomite
80-81	74.	Large cavern-filling of Manetoe facies dolomite in the Arnica Formation at Section 40
81	75.	Large fragments of Arnica Formation dolostone encased in Manetoe facies dolomite
81	76.	Large development of Manetoe facies dolomite in the Nahanni Formation at Nahanni Butte
82	77.	A close-up view of an irregular, limestone-dolomite contact in the Nahanni Formation
82	78.	A close-up view of a sharp limestone-dolomite contact in the Nahanni Formation
91	79.	Index map for Figure 80
92-93	80.	Air photo views of type and reference sections of formations described in Appendix 1
in pocket	81.	Geological map of central Virginia Falls

Frontispiece. *Looking northwest at Hell's Gate and Pulpit Rock on the South Nahanni River. The rocks exposed in the canyon walls are Middle Ordovician dolostones and limestones of the Sunblood Formation (ISPG Photo no. 1420-5).*

THE PRAIRIE CREEK EMBAYMENT AND LOWER PALEOZOIC STRATA OF THE SOUTHERN MACKENZIE MOUNTAINS

Abstract

Lower Paleozoic strata in the southern Mackenzie Mountains are mainly shallow water carbonates which were deposited on a broad depositional shelf (Mackenzie Shelf). Dramatic changes in the position of the shelf edge were due to the inception, growth and disappearance of Root Basin and Prairie Creek Embayment. In Middle Ordovician to Middle Silurian time subtidal "deep water" limestone, shale and dolostone of the Esbataottine, Whittaker and Road River formations accumulated in Root Basin, and shallow water dolostones of the Mount Kindle and Root River (new formation) formations formed on the basin rim. Orange, dolomitic siltstones of the Cadillac Formation (new formation), fossiliferous limestone of the Vera Formation (new formation) and laminated, silty dolostones and evaporites of the Camsell Formation filled Root Basin in Late Silurian to earliest Devonian time.

By Early Devonian time, Root Basin was no longer a depositional basin and the entire southern Mackenzie Shelf was covered by the shallow water and intertidally-deposited laminated dolostones of the Arnica and Sombre formations. However, the southern entrance of Root Basin remained as a deep water embayment along the shelf edge. This embayment (Prairie Creek Embayment) was dominated by centripetal hemipelagic sedimentation with abundant sediment gravity flow deposits of detrital carbonates, derived in part from the shelf edge.

Following deposition of the Arnica Formation the region of Root Basin again received deep water shale and limestone sediments (Funeral Formation) for a brief time, but, by latest Early Devonian time, the complex paleogeography of Root Basin and the Prairie Creek Embayment was replaced by a linear depositional shelf edge, along which shallow water fossiliferous limestones of the Nahanni and Headless formations were deposited.

Résumé

Des strates du Paléozoïque inférieur des monts Mackenzie du sud sont, pour la plupart, des carbonates déposés en eaux peu profondes sur un vaste plateau de déposition (le plateau de Mackenzie). Des changements saillants de la position de la bordure du plateau ont résulté de l'initiation, de la crossance, et de la disparition du bassin de Root et de la baie de Prairie Creek. Pendant l'Ordovicien moyen, jusqu'au Silurien moyen, des calcaires, des schistes argileux et des dolomies infralittoraux déposés en eaux profondes des formations d'Esbataottine, de Whittaker et de Road River se sont accumulés à l'intérieur du bassin Root, et des dolomies déposées en eaux peu profondes des formations de Mount Kindle et de Root River (nouveau nom) se sont formées sur le bord du bassin. Des aleurolites dolomitiques orangées de la formation de Cadillac (nouveau nom), des calcaires fossilifères de la formation de Vera (nouveau nom) ainsi que des dolomies laminées et silteuses et des évaporites de la formation de Camsell se sont déposés au bassin de Root durant le Silurien supérieur jusqu'au Dévonien inférieur.

Au Dévonien inférieur, le bassin de Root n'était plus un bassin de déposition et tout le plateau de Mackenzie du sud était couvert de dolomies laminées déposées en eaux peu profondes et intercotidales des formations Arnica et Sombre. Cependant, l'entrées sud du bassin de Root demeurait une baie d' eaux profondes le long de la bordure du plateau. Cette baie (baie de Prairie Creek) était dominée par des sédiments centripètes et hémipélagiques qui comprenaient des dépôts abondants dûs à l'écoulement par gravité des carbonates détritiques, ce qui provenaient en partie de la bordure du plateau. Par suite à la déposition de la formation d'Arnica, et pendant une brève période, la région du bassin de Root de nouveau accumulait des schistes argileux déposés en eaux profondes du Dévonien inférieur, la paléogéographie complexe du bassin de Root et de la baie de Prairie Creek a été transformé en une bordure de plateau de déposition linéaire, le long de laquelle des calcaires fossilifères d'eaux peu profondes des formations de Nahanni et de Headless se sont déposées.

Summary

The Ordovician-Devonian sequence in the southern Mackenzie Mountains is part of the miogeoclinal wedge of shelf and slope sediments that borders the entire western margin of the North American Plate. The boundary between shallow water depositional shelf and offshore slope and basinal deposits fluctuated over a broad region in the southern Mackenzie Mountains during Early Paleozoic time. These relatively rapid changes in the position of the shelf edge in the southern Mackenzie Mountains were the consequence of the inception, development and disappearance of the Root Basin, a major tectono-sedimentologic entity occupying this region. North and south of this region the shelf-to-basin transition was less mobile.

In Middle Ordovician to Middle Silurian time Root Basin became a distinctive bathymetric feature that received the largely subtidal to deeper water argillaceous limestones, shales and dolostones of the Esbataottine, Whittaker and Road River formations. The periphery of Root Basin was rimmed by shallow water carbonates of the Mount Kindle and Root River (new formation) formations during this time. In late Silurian time (Ludlow) the Root Basin was infilled by marine siltstones of the Cadillac Formation (new formation). Large volumes of silt, which may have been eroded from landward areas possibly exposed by a Late Silurian drop in sea level, formed a westward-sloping submarine wedge in Root Basin. Turbidites and debris flows were shed off the flanks of crinoid-bearing mud mounds that populated the upper parts of this slope.

Uplift along the axis of the Sombre Salient (the southern extension of the Redstone Arch) combined with the infilling of Root Basin may have initiated development of the Prairie Creek Embayment at the south end of Root Basin in earliest Devonian time as indicated by the distribution of the relatively shallow water sediments of the Vera Formation (new formation) and the Corridor Member (new member) of the Camsell Formation. In late Early Devonian and early Middle Devonian time, the peritidally-deposited dolostones of the Sombre and Arnica formations spread across Root Basin up to the edge of the Prairie Creek Embayment. During this period Root Basin ceased to be a significant bathymetric feature and the embayment was dominated by autochthonous, centripetal, hemipelagic sedimentation of abundant fine grained, shelf edge derived turbidites of the detrital member of the Sombre Formation, the pink shale member of the Cadillac Formation, and the basinal member of the Arnica Formation. Most turbidites contain abundant, uncoated, pelletal lime mudchips, >0.5 m long, in an argillaceous and silty, pink coloured, lime mud matrix, particularly in the pink shale member of the Cadillac Formation. Biogenic components, apart from pellets, are notably absent in most of these hemipelagic deposits, although crinoids are abundant locally in the Arnica basinal member. The lack of organic material in the embayment sediments of this period may have permitted almost all the iron in the sediment to remain in the oxidized state and to impart a pink colouration to these sediments.

Following deposition of the Arnica Formation, large parts of the depositional shelf subsided and Root Basin was re-established as a bathymetric feature. Most of the shelf surrounding the Prairie Creek Embayment disappeared but remnants of both sides of the embayment remained as small areas of shallow water sedimentation. Pelletal lime packstones of the Landry Formation accumulated on this area, which was bordered by regions of deeper water deposition of Funeral Formation shale. After deposition of the Funeral and Landry formations, the Root Basin and the Prairie Creek Embayment no longer influenced sedimentation. Instead, the complex paleogeography of the Root Basin and Prairie Creek embayments was replaced by a nearly linear northwest-trending depositional shelf edge. Biostromal limestones of the Nahanni Formation were deposited in shallow water east of this boundary whereas argillaceous and skeletal lime wackestones of the Headless Formation accumulated farther west. Subsequent deposition of the Late Devonian shales of the Fort Simpson Formation marked the end of shelf carbonate deposition in the Mackenzie Mountains region in early Paleozoic time.

The Devonian part of the sequence was affected by a widespread diagenetic event that resulted in the distinctive white dolomite of the Manetoe facies. This coarsely crystalline white dolomite has replaced parts of the Arnica, Landry, Headless and Nahanni formations. Consequently, the Manetoe Formation of previous usage has been redefined here as a diagenetic facies. The Delorme Formation of previous usage also has been redefined here to include the Root River and Vera formations and parts of the Road River and Cadillac formations.

Sommaire

La séquence des strates ordoviciennes-dévoniennes dans les monts Mackenzie du sud appartient au prisme miogéosynclinal des sédiments de plateau et de pente quie encadre l'entière marge occidentale de la plaque nord-américaine. La limite entre des dépôts en eau peu profonde de plateau et de pente littorale et des dépôts de bassin fluctuait sur une vaste région aux monts Mackenzie du sud pendant le Paléozoïque inférieur. De tels changements relativement rapides de la position de la limite du plateau dans les monts Mackenzie du sud résultaient du commencement, de l'évolution, et de la disparition du bassin de Root, un élément tectonostratigraphique significatif de cette région. Au nord et au sud de la région, la transition du plateau au socle était moins mobile.

De l'Ordovicien moyen jusqu'au Silurien moyen, le bassin de Root revêtait un caractère bathymétrique distinct, accumulait des dèpôts de calcaires argileux, de schistes argileux, et de dolomies des formations d'Esbataottine, de Whittaker et de Road River et qui provenaient en grande partie des milieux infralittorales et d'eau profonde. La périphérie du bassin de Root était bordée de carbonates en eau peu profonde des formations de Mount Kindle et de Root River (nouveau nom) pendant cette période. Pendant le Silurien supérieur (Ludlow), le bassin de Root était rempli de siltstones marins de la formation de Cadillac (nouveau nom). De grands volumes de lais, possiblement érodés des régions vers la terre et exposés pendant une période, au Silurien supérieur, d'abaissement du niveau de la mer, constituait un prisme sous-marin incliné vers l'ouest dans le bassin de Root. Des turbidites et des écoulements d'éboulis s'épandaient sur des flancs des cônes de boue contenant des crinoïdes qui se trouvaient au sommet de cette pente.

Un soulèvement le long de l'axe de Sombre Salient (l'extension sud de l'arche Redstone) et l'effet du remplissage du bassin de Root possiblement ont généré la formation de Prairie Creek Embayment à l'extrêmité sud du bassin de Root pendant le Dévonien inférieur, comme indique la répartition des sédiments d'eau relativement peu profonde de la formation de Vera (nouveau nom) et du membre de Corridor (nouveau nom) de la formation de Camsell. Vers la fin du Dévonien inférieur et vers le début du Dévonien moyen, des dépôts péricotidaux de dolomies des formations de Sombre et d'Arnica s'étendaient sur le bassin de Root jusqu'à la limite de la baie de Prairie Creek. Pendant cette période, le bassin de Root a cessé d'être un caractère bathymétrique significatif et la baie était dominé par la sédimentation autochtone, centripète, et hémipélagique des turbidites fines et abondantes qui provenaient du rebord de plateau du membre détritique de la formation de Sombre, du membre aux schistes argileaux roses de la formation de Cadillac, et du membre de bassin de la formation d'Arnica. La plupart des turbidites se composent d'abondants éclats de boue calcaires à granules sans enrobage, à >0.5 m de long, localisées dans une matrice rose de boue calcaire argileuse et silteuse, particulairement dans le membre aux schistes argileux roses de la formation de Cadillac. Des composants biogénétiques, outre que des granules, ne sont pas du tout évidents dans la majorité des dépôts hémipélagiques, bien que des crinoïdes sont abondants localement dans le membre du bassin d'Arnica. Le manque de matière organique dans les sédiments de la baie pendant cette période a possiblement permi l'accumulation de fer oxydé, ce qui a donné une couleur rose aux sédiments.

Par suite à la déposition de la formation d'Arnica, de grandes parties du plateau de sédimentation se sont abaissées et le bassin de Root a revêtu à nouveau un caractère bathymétrique. La majeure partie du plateau qui entourrait le bassin de Root est disparu, cependant des restants des deux côtés de la baie témoignent comme des petites régions de sédimentation en eau peu profonde. Des packstones calcaires, de la formation de Landry, présents en forme de granules, se sont accumulés dans cette région, encadrés par des zones de sédimentation en eau profonde des schistes argileux de la formation de Funeral. Suite à la mise en place des formations de Landry et de Funeral, le bassin de Root et la baie de Prairie Creek cessaient d'influencer la sédimentation. De plus, la paléogéographie complexe du bassin de Root et de la baie de Prairie Creek a cédé place à la formation d'un rebord de plateau de déposition orienté de façon plutôt linéaire vers le nord-ouest. Des calcaires de biostromes de la formation de Nahanni ont été déposés en eau peu profonde à l'est de cette limite, alors que des wackestones squelettiques calcaires et argileux de la formation de Headless se sont accumulés plus à l'ouest. La sédimentation subséquente des schistes argileux du Dévonien supérieur de la formation de Fort Simpson délimite la fin de la sédimentation des carbonates de plateau dans les monts Mackenzie durant le Paléozoïque inférieur.

La partie dévonienne de la séquence était influencée par un événement diagénétique de grande envergure et qui a abouti à la formation de la dolomie blanche et distincte du faciès de Manetoe. Cette dolomie blanche à cristaux grossiers a remplacé quelques parties des formations d'Arnica, de Landry, de Headless, et de Nahanni. Par conséquent, la formation antérieurement dénommée Manetoe se voit redéfinie ici en faciès diagénétique. La formation de Delorme établie antérieurement a été également redéfinie et actuellement comprend les formations de Root River et de Vera, ainsi que des parties des formations de Road River et de Cadillac.

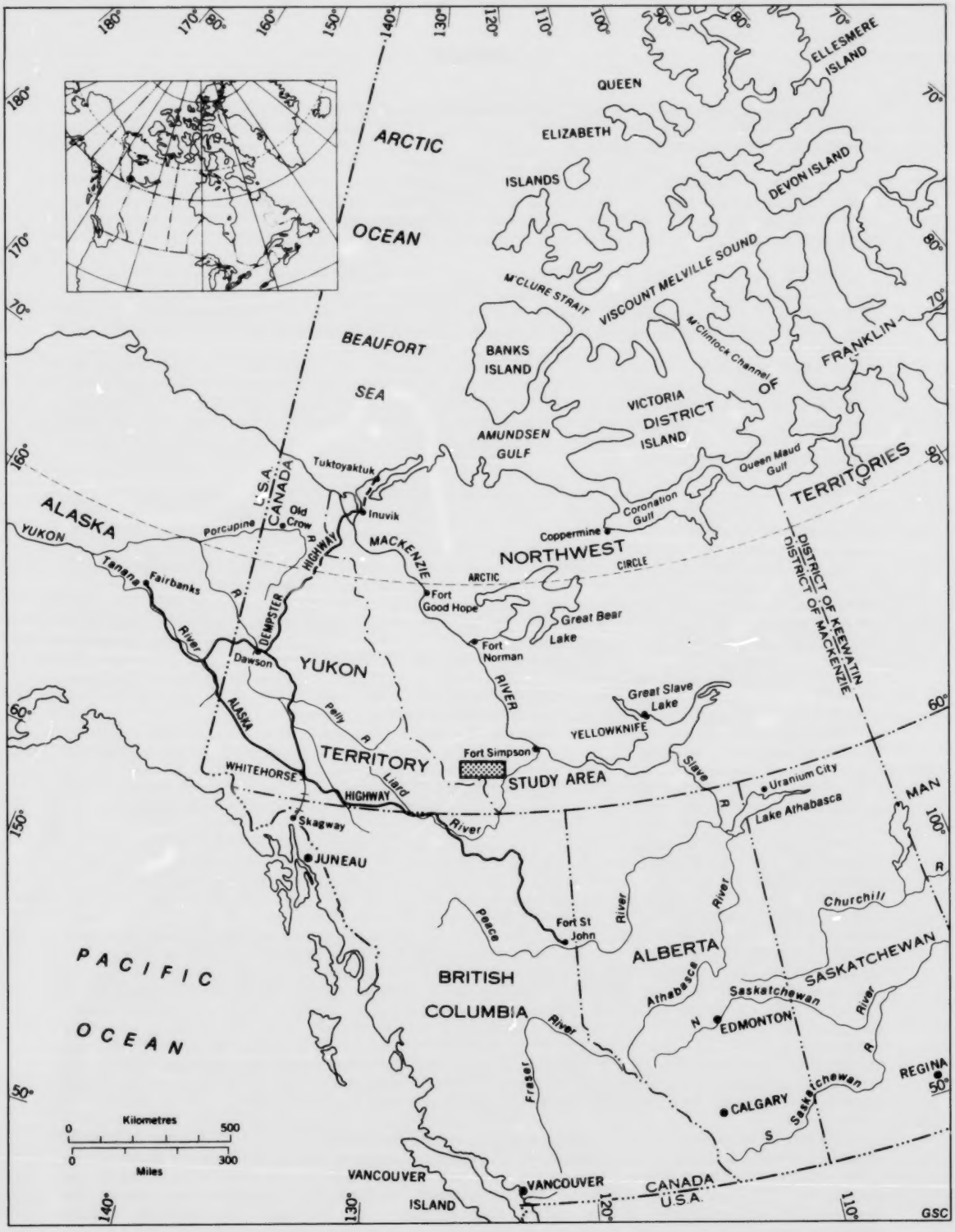


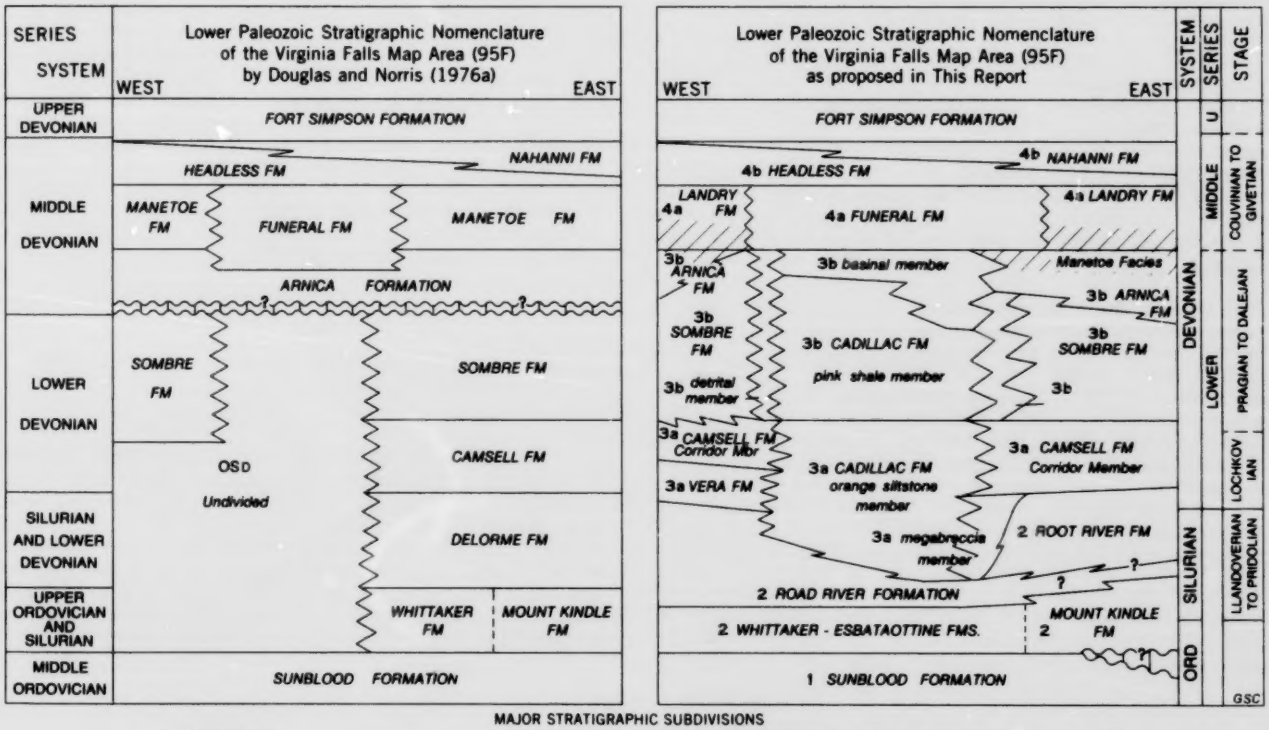
Figure 1. *Index map of western Canada with the location of the study area shown in black.*

INTRODUCTION

This report (Fig. 1) deals primarily with a rock sequence of Middle Silurian to Middle Devonian age that is transitional between shelf carbonates in the northeastern part of the Virginia Falls map area (NTS 95F) and basinal shales of the Road River Formation farther south and west (Fig. 2). These transition facies were deposited in the Root Basin and a paleo-depression herein named the Prairie Creek Embayment. This embayment, which is characterized by subtidal slope deposits, occurs in the north-central part of the Virginia Falls map area and is bounded on the east, north, and west by shelf carbonates. Carbonates on the west side were deposited on a shallow water shelf salient named the Sombre Salient. Southward and southwestward, the transitional units become increasingly shaly and lose their identities in the deep water Road River Formation in the southwestern part of the map area.

Deposition of underlying Middle and Upper Ordovician strata in Root Basin predated the development of the Prairie Creek Embayment and the Sombre Salient. Distribution of those units has nonetheless been mapped in the embayment area but they have been examined in relatively few stratigraphic sections. Consequently, discussion of the Ordovician strata is relatively brief. Similarly, Upper Devonian shales and siltstones postdate the embayment and will not be discussed in detail.

The embayment as presently exposed is bounded on the west by an east-directed thrust fault and on the east by a west-directed thrust (Fig. 81, in pocket). Each of these may have been localized by structural weakness inherent in the facies change from carbonate to thinner bedded more argillaceous rocks. Each has resulted in the abrupt juxtaposition of shelf facies on embayment facies and the consequent overriding, in large part, of the critical boundary facies. Rocks of the embayment have been disrupted also by a series of steeply dipping reverse faults which may predate the above noted thrust faults.



MAJOR STRATIGRAPHIC SUBDIVISIONS

Sunblood Platform	1	Upper Cadillac phase of the Prairie Creek assemblage	3b
Mount Kindle-Root River assemblage	2	Landry-Funeral phase of the Funeral-Headless assemblage	4a
Lower Cadillac phase of the Prairie Creek assemblage	3a	Headless-Nahanni phase of the Funeral-Headless assemblage	4b

Figure 2. *Schematic charts of the lower Paleozoic stratigraphic nomenclature in the Virginia Falls map area, showing a comparison between the earlier nomenclature of Douglas and Norris (1976a) and the nomenclature used in this report. The line of section for both charts extends east-west across the northern part of the Virginia Falls map area. The numbers attached to names in the stratigraphic chart of formational and member names used in this report refer to the major stratigraphic subdivisions to which these units belong. The numbers and their corresponding major stratigraphic subdivisions are listed above. The Esbataottine Formation was not mapped by the writers, but may be equivalent to the lower part of the Whittaker Formation.*

Understanding the nature and genesis of the embayment and delineation thereof should aid exploration for carbonate-hosted lead-zinc deposits. The Cadillac lead-zinc deposit, although geographically adjacent to the Silurian-Devonian facies change, probably is unrelated to it because the deposit occurs in stratigraphically lower, Ordovician strata. The data presented here may aid in the search for similar deposits elsewhere in the Virginia Falls map area.

Present work

Field work related to this report was done during the summers of 1975, 1976 and 1981. A total of four months, with helicopter support, were spent in the field, and most of the field work was concentrated in the area around Prairie Creek (Fig. 3). Forty-two stratigraphic sections of the Ordovician-Devonian sequence were measured (Fig. 3, Table 1). Lithostratigraphic units were defined within these sections and, from numerous ground tranverses, their distribution was mapped at a scale of 1:50 000 and presented here at a scale of 1:125 000 (Fig. 81, in pocket). Data from these surface sections and traverses were supplemented with information from six surface sections from Banff Oil Ltd. and two subsurface well sections (Appendix 3).

The area around Prairie Creek is of particular importance because it is in this region that the accepted Silurian and Devonian stratigraphic nomenclature of the southern Mackenzie Mountains is least applicable. This deficiency has been recognized implicitly by Douglas and Norris (1976a) in their geologic map of the Virginia Falls map area (NTS 95F) where the Silurian-Devonian sequence around Prairie Creek and in the southwest part of the map area has been mapped simply as undivided Ordovician, Silurian and Devonian shales, including some limestone and sandstone.

Identification and definition of facies were aided by the examination of slabbed and polished hand samples (100); and by thin sections (50) of representative lithologies, stained with alizarin red-5 for differentiation of calcite and dolomite, and with potassium ferricyanide to indicate iron content (Friedman, 1959). However, these are used merely in support of field observations and are not described in detail. Realistic correlation of shelf facies with embayment facies is in part based on observed transitions, and in part on paleontologic data which appear in Appendix 2 and which will be specifically noted where appropriate. Description of carbonate rocks follows the classification of Dunham (1962).

Acknowledgments

Part of the report area lies with Nahanni National Park. The geology there was studied with the permission of the Parks Branch of the Department of Indian and Northern Affairs. The co-operative assistance of Park Warden Ray Frei and his staff was greatly appreciated. Correlation of stratigraphic units relies heavily on paleontologic age control, partly provided by A.W. Norris (brachiopods), who collected his own material in the field, and partly provided by B.S. Norford (graptolites), by A.E.H. Pedder (corals) and by T.T. Uyeno (conodonts) each of whom identified material collected by the writers. All fossil identifications used in this report appear in Appendix 2. R. Ludvigsen accompanied the writers in the field and studied Ordovician and Silurian trilobites and stratigraphy. Assignment of boundaries of the Whittaker Formation and informal units within the Whittaker, for mapping purposes, were placed mainly on his advice. Able assistance in the field was provided by L. Christianson and J. Rouelle in 1975, by C. Staedtler and T. Weiss in 1976, and by M. Teitz in 1981. Lead isotope analyses were provided by G.L. Cumming of the Department of Physics at the University of Alberta.

Influence of physiography

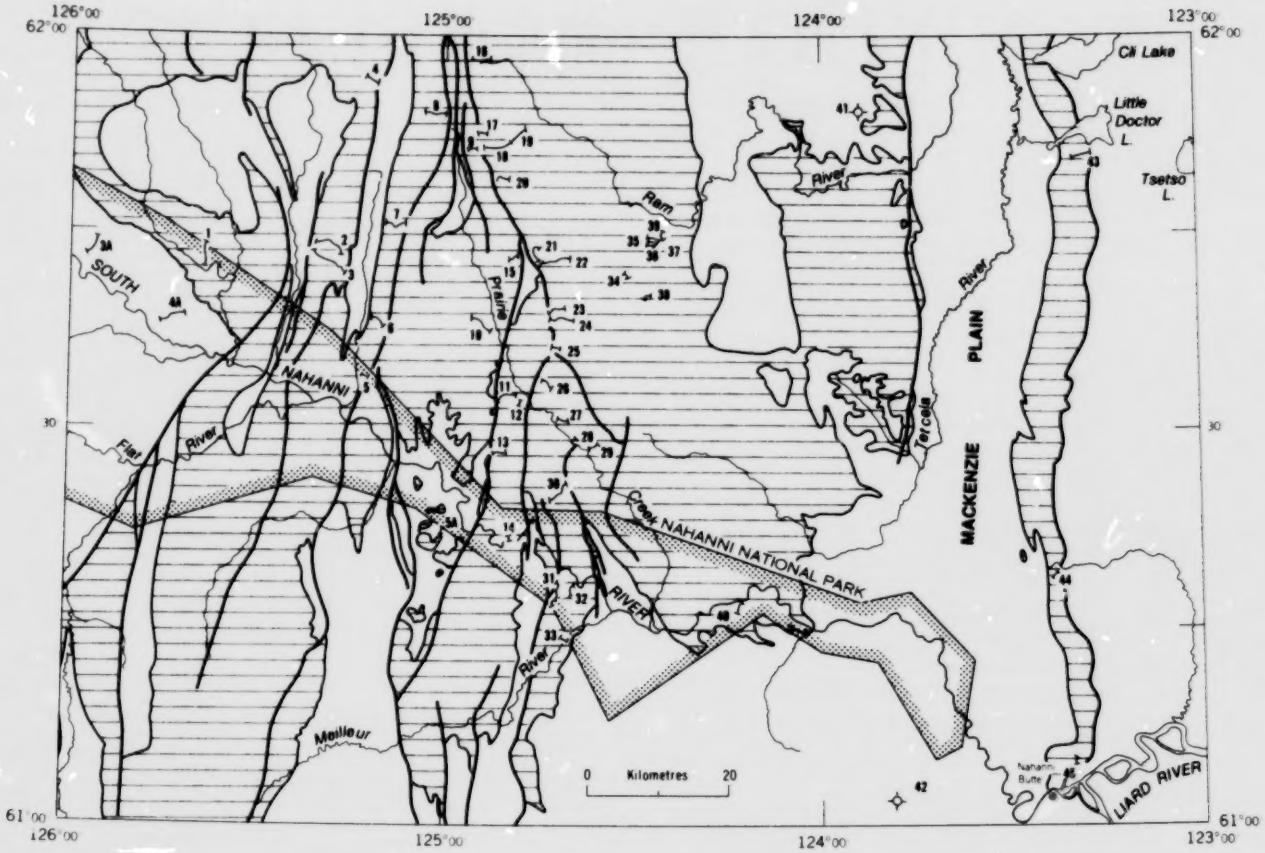
A detailed account of physiographic features and terrain types in the Virginia Falls map area was given by Douglas and Norris (1960). In general, the resistant Silurian-Devonian shelf carbonate sequence of the northeastern part of the Virginia Falls map area is well exposed and hence is readily mappable even by helicopter on a reconnaissance scale. However, this is not true for the silty and shaly transitional sequence around Prairie Creek or in the southwestern part of the Virginia Falls map area where the exposure is moderate to poor. The physiographic relief of about 400 m in the Prairie Creek area is almost as great as in the nearby shelf carbonate succession, but the abundant terrigenous material in the transitional sequence results in the area being mantled with forest. The forest cover not only masks the bedrock geology, but also prevents helicopter landings, thus precluding observations of critical areas. The tenuous nature of geological contacts in such areas is shown by the "assumed" contact on the geologic map (Fig. 81, in pocket). South of the South Nahanni River the Ordovician-Silurian-Devonian sequence of Douglas and Norris (1976a) is predominantly shale and therefore forms a landscape of low relief that is covered with vegetation.

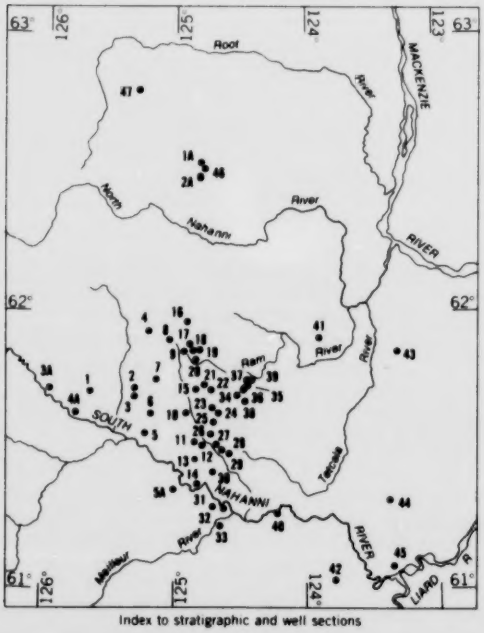
Access

Nahanni National Park straddles the South Nahanni River which cuts across the southern part of the study area. The river provides access via small powerboat and fixed-wing float planes. The only practical access to the surrounding territory, for the purpose of conducting geological studies, is by helicopter. A good gravel surface airstrip for wheeled aircraft is located at the Cadillac Mine site on Prairie Creek (Fig. 1). Trucks and other heavy equipment were brought to the mine site overland from Fort Simpson on a winter road.

Previous work

Operation Mackenzie, initiated by the Geological Survey of Canada in 1957, was the first comprehensive investigation of much of the southern Mackenzie Mountains. Data gathered during the summer of 1957 were published in a number of Geological Survey of Canada papers dealing with map areas of 1:250 000 scale, including the Virginia Falls map area (Douglas and Norris, 1960). The existing Silurian and





Distribution of Silurian to Middle Devonian

Major faults

Stratigraphic sections

Well sections

Figure 3. *Location map of stratigraphic sections and well sections used in this study. Also shown are the major faults and the distribution of Silurian to Middle Devonian strata (stippled pattern).*

TABLE 1

SECTION NUMBER	SECTION AND/OR WELL NAME	SUB-ROOT RIVER AND EQUIVALENTS	ROAD RIVER	CADILLAC	ORANGE SILTSTONE MEMBER	PINK SHALE MEMBER	ROOT RIVER AND SILURIAN - DEVONIAN UNDIVIDED (SUD)	VERA	CAMSELL-CORRIDOR MEMBER	SOMBRE (Sombre-detrital member (DR))	ARNICA (Arnica basinal member (b))	FUNERAL	LANDRY	HEADLESS	NAHANNI	MANETOE FACIES
1	Cathedral Mountain		397.5					147.0		1086.0	13.5+	244.0[3]		122.0[3]	12.0[3]	
2	Arnica Ridge 1								70.5+	918.5	111.5+					31.5 (ARNICA)[1]
3	Arnica Ridge 2							267.5+	451.5	1069.5		20.0+	40.0			
4	Arnica Ridge 3										11.0+	668.0		76.0	215.0+	
5	South Manetoe 2		118.5+	701.5	264.5	437.0				269.0 (DR)		90.0+				
6	South Manetoe 1		169.5+	334.5	153.5	181.0				350.0 (DR)		139.5+		64+		
7	Manetoe Range 1		126.0+					271.5		686.5			60.0	18.0	45.0+	78.0 (HEADLESS AND LANDRY)
8	Manetoe Range 2								731.0+	556.5			187.5	238.5+		102.0 (LANDRY)
9	West Tundra 2		50.0+	400.0	?	?				250.0 (DR)	150.0+ (b)					
10	Funeral Range 1		168.0+	408.5+	408.5+	?					135.0+ (b)					
11	Prairie Creek 4	288.0 + (WHITTAKER)	168.0	993.0	840.0	153.0					334.0 (b)	368.5	22.0	250.0	79.5+	
12	Prairie Creek 7	126.5 + (WHITTAKER)	169.5													
13	West Headless			141.0+	27.0+	114.0					93.0 (b)	6.0+				
14	Second Canyon 3										250.0 (b)+					
15	West Tundra 1			94.5+		94.5+					305.0 (b)	150.0		207.5	306.0+	
16	North Tundra							288.0+	567.1	247.5+						
17	North Tundra 2							35.5+	1143.8							
18	Tundra Ridge							146.0+	914.0	1101.5						
19	Tundra Ridge 2										2.5+	466.0		177.0	231.0+	
20	Tundra Face 1								802.7+							
21	South Tundra 2							100.3+	778.5							
22	South Tundra 1			60.0+	60.0+			126.0	926.5	1378.5						
23	South Tundra 8		156.0+	561.0+	561.0+											
24	South Tundra 6		115.5+	516.0	516.0				464.5	535.4+						
25	South Tundra 7						517.0+		33.0+							
26	Cadillac 1			178.0+	178.0+											

Devonian formational nomenclature for the southern Mackenzie Mountains, established during Operation Mackenzie, applies primarily to the shelf carbonate sequence. Map 1378A (Douglas and Norris, 1976a) is the most recent application of this stratigraphy to the Virginia Falls map area. The map is excellent with respect to the shelf carbonate sequence but is of necessity generalized in areas underlain by deeper water more argillaceous rocks where soils and forest cover have developed, thereby precluding the application of airborne rapid reconnaissance methods to the same level of accuracy as in the better exposed carbonates terrains. Consequently, in the area of the Prairie Creek Embayment, Douglas and Norris used a single undifferentiated unit "OSD" to represent all basin and slope facies of Late Ordovician to Early Devonian age (Fig. 2).

Other reports dealing specifically with the Silurian-Devonian succession in this area include Noble and Ferguson (1971), Law (1971), Morrow (1975, 1976, 1978), and Cook (1977). Paleontological work in this area has been published by Lenz and Jackson (1964), Jackson et al. (1978), Chatterton (1978), and more recently by Lenz (1980) and Norris and Uyeno (1981). In addition to these studies there are several company and consultant reports on file with the Department of Indian and Northern Affairs that deal with the stratigraphy and structure of the Virginia Falls area.

Regional setting

The Virginia Falls map area lies across the shelf-to-basin transition or depositional shelf edge of lower Paleozoic strata in the southern Mackenzie Mountains. The position of

SECTION NUMBER	SECTION AND/OR WELL NAME	SUB-ROOT RIVER AND EQUIVALENTS	ROAD RIVER	CADILLAC	ORANGE SILTSTONE MEMBER	PINK SHALE MEMBER	ROOT RIVER AND SILURIAN - DEVONIAN UNDIVIDED (SUD)	VERA	CAMSELL-CORRIDOR MEMBER	SOMBRE [Sombre detrital member (DR)]	ARNICA [Arnica basinal member (b)]	FUNERAL	LANDRY	HEADLESS	NAHANNI	MANETOE FACIES
27	Prairie Creek 2									439.0+	111.0+					
28	Prairie Creek 1								75.0+	579.0+						
29	Prairie Creek 3									313.0+	433.0+					41.0+ (ARNICA)
30	Headless						157.0+		477.0	489.0+						
31	Second Canyon 2										111.0+	159.0		72.0+		
32	Second Canyon 1								215.0+	276.0	872.0	25.0?		95.0?	28.5+	~61.5 (ARNICA)
33	Meilleur River										27.5+	?		65.5?	241.0+	
34	South Ram Plateau										5.0+		100.0	15.0+		~60.0 (ARNICA AND HEADLESS)
35	West Ram Plateau 1										3.0+(b)	228.0		96.0+		
36	West Ram Plateau 2										201.0+?			28.5+		151.5 ARNICA)
37	Ram River 2										94.5+	154.0		71.5	38.0+	94.5 (ARNICA)
38	Sun Dog Creek										217.5+		79.0	82.0	42.0+	43.5 (ARNICA AND HEADLESS)
39	Ram Plateau 1											354.6+		213.0	234.0	
40	First Canyon									104.0+	625.5		54.0	30.0	24.0+	85.0 (ARNICA AND LANDRY)
41	Texaco Ram Plateau B-44										40.5+	353.0	71.0	85.0	167.0	
42	Pan Am Mattson Creek	430.0 + (MT KINDLE)					338.5 (SUD)		402.5	822.0	505.0		61.0	42.5	216.0	~180.0 (LANDRY, HEADLESS, NAHANNI)
43	Red Rock Pass	441.5 (MT KINDLE)					87.5 (SUD)				613.5		46.0	3.0	204.0+	~30.5 (ARNICA, LANDRY HEADLESS)
44	Grainger River										344.0+		30.0	49.5	130.0+	~118.0 (ARNICA, LANDRY, HEADLESS)
45	Nahanni Butte										135.5+			7.5	195.5	~213.5 (ARNICA, NAHANNI, HEADLESS)
46	Trough Creek		197.0+	658.0	658.0			198.0	479.5	286.0?	143.0?	257.0	229.0			
47	Pastel Creek	235.5 + (WHITTAKER)	242.0				511.5	168.0	564.0	592.5	250.0		20.0+			~60.0 (ARNICA AND LANDRY)

GSC

Notes:

1. *Formation names in brackets indicate formations altered to the Manetoe facies*
2. *Thicknesses from A.W. Norris (pers. comm.)*

this shelf edge shifted throughout Silurian and Devonian time until, in Late Devonian time, it retreated eastward beyond the Virginia Falls map area and Frasnian-Famennian shales were deposited across this region.

The basinal terrigenous sediments west and south of the shelf edge in the Virginia Falls map area have been assigned generally to the Selwyn Basin (Douglas, 1970; Gabrielse, 1967) and, in particular, to the Meilleur River Embayment of the Selwyn Basin (Fig. 4). This large embayment includes post-Middle Ordovician to pre-Upper Devonian basinal shales and siltstones that are underlain by the Middle Ordovician Sunblood Formation and overlain by the Late Devonian Besa River Formation. The Meilleur River Embayment, as discussed in this report, is more restricted than the original usage of Bassett and Stout (1967) who included some of the shelf carbonates. Shelf sediments are specifically excluded from the Meilleur River Embayment as defined in this report.

In addition to the Meilleur River Embayment, there are two other major tectono-sedimentologic elements that influenced the early Paleozoic history of the southern Mackenzie Mountains; the Redstone Arch and Root Basin (Fig. 4). Root Basin is a northern extension of the Meilleur River Embayment and is separated from the Selwyn Basin on its west side by the Redstone Arch. Douglas (1970) used the term Mackenzie Arch apparently as a blanket term for a broad, arcuate, generally positive, intermittently emergent belt whose axis shifted basinward or shoreward and longitudinally along the belt from period to period. Within that broad concept it is possible to define specific positive elements, such as the Redstone Arch. Redstone Arch (Gabrielse et al., 1973; Cook, 1978) is used here because it is a more accurately defined feature specifically related to Silurian and Devonian deposition in the southern Mackenzie Mountains. Similarly, Root Basin of Gabrielse (1967) is used here instead of Mackenzie Trough of Douglas (1970). The

southern limits of Redstone Arch and Root Basin are ill-defined but they are considered here to extend south to the Virginia Falls map area (Fig. 4). In this map area the Sombre Salient appears to represent the southernmost expression of the Redstone Arch and the Prairie Creek Embayment appears to represent a Devonian remnant of Root Basin at a time when the Root Basin north of the Virginia Falls map area had been filled with sediment and was not a bathymetric feature. Thus, development of the Sombre Salient and the Prairie Creek Embayment appear to be directly related to the development of the regional arch-and-trough pair of the Redstone Arch and the Root Basin. Because the pair trended obliquely to the regional shelf edge they passed southward from the shelf into the region of basinal deposition representd by the Meilleur River Embayment in the southern Mackenzie Mountains. In the deeper water of the Prairie Creek Embayment a relatively thin sequence of terrigenous and resedimented carbonate sediments was deposited. These deposits were unlike the shallow water carbonate sediments that filled the Root Basin farther north where deposition kept pace with subsidence at this time.

MAJOR STRATIGRAPHIC SUBDIVISIONS AND RELATIONSHIPS

The lower Paleozoic strata exposed in the study area may be divided into four major subdivisions (Fig. 2). These subdivisions reflect abrupt changes in patterns of sedimentation related to the inception, growth and filling of Root Basin and the Prairie Creek Embayment and their ultimate disappearance as bathymetric features. In ascending stratigraphic order these subdivisions are:

1. The Sunblood Platform. This subdivision forms the base of the exposed Paleozoic sequence and is composed solely of the Sunblood Formation. Shallow water, shelf carbonate deposition prevailed across the region of the southern Mackenzie Mountains during deposition of this stratigraphic subdivision.

2. The Mount Kindle-Root River assemblage. After deposition of the Sunblood Platform, the depositional shelf edge moved eastward in Late Ordovician time as the Root Basin formed, so that the shallow shelf carbonates of the Mount Kindle and Root River formations passed westward to the deeper water deposits of the Esbataottine, Whittaker and Road River formations within the study area (Fig. 2).

3. The Prairie Creek assemblage. This subdivision records the inception and growth of the Prairie Creek Embayment, a paleogeographic feature that is contained entirely within the Virginia Falls map area. It is comprised of a complex array of commonly very diachronous formations and members that may be subdivided into two phases; the Lower Cadillac phase and the Upper Cadillac phase (Fig. 2). The Lower Cadillac phase, marking the inception of the embayment in earliest Devonian time, is composed of the orange siltstone and megabreccia members of the Cadillac Formation, the Vera Formation, and the Corridor Member of the Camsell Formation. The Upper Cadillac phase, covers deposition during the continued existence of the embayment throughout Early Devonian time, and comprises the Sombre and Arnica formations including the Sombre detrital member, the basinal member of the Arnica and the pink shale member of the Cadillac Formation. The Cadillac Formation, the Sombre detrital member and the Arnica basinal member represent the sediments that filled the paleodepression of the Prairie Creek Embayment and, hence, are confined to the Prairie Creek area, whereas the Vera, Camsell, Sombre and Arnica formations that surround the embayment extend far beyond the Virginia Falls map area.

4. The Funeral-Headless assemblage. This subdivision records the disappearance of the Prairie Creek Embayment when Root Basin was re-established as a bathymetric feature in early Middle Devonian (Couvinian) time. It records also the eventual return to a simple westward transition from shallow shelf to deeper water deposition with the disappearance of Root Basin as a sedimentologic influence in Middle Devonian time. The Funeral-Headless assemblage is divided into two distinct phases; a lower Funeral-Landry phase, including the Landry and Funeral formations, and an upper Headless-Nahanni phase, including the Headless and Nahanni formations (Fig. 2). Parts of the Sombre Salient and Prairie Creek Embayment were preserved to some degree during deposition of the Funeral-Landry phase but disappeared during deposition of the Headless-Nahanni phase.

It is not possible to gain a coherent understanding of the origin of this Paleozoic sequence without recognition of these facies assemblages as the primary stratigraphic entities. It seems likely that episodic eustatic sea level rises, coupled with tectonic events, are responsible for the major changes between each of these facies assemblages as sedimentation continued. The customary style of stratigraphic description, in which formations are treated individually in ascending stratigraphic order, is inadequate to deal with the complex stratigraphic variations exhibited by this sequence. For ease of reference, however, all the formations and members discussed in the text are described individually as part of the overall stratigraphic subdivision in which they occur.

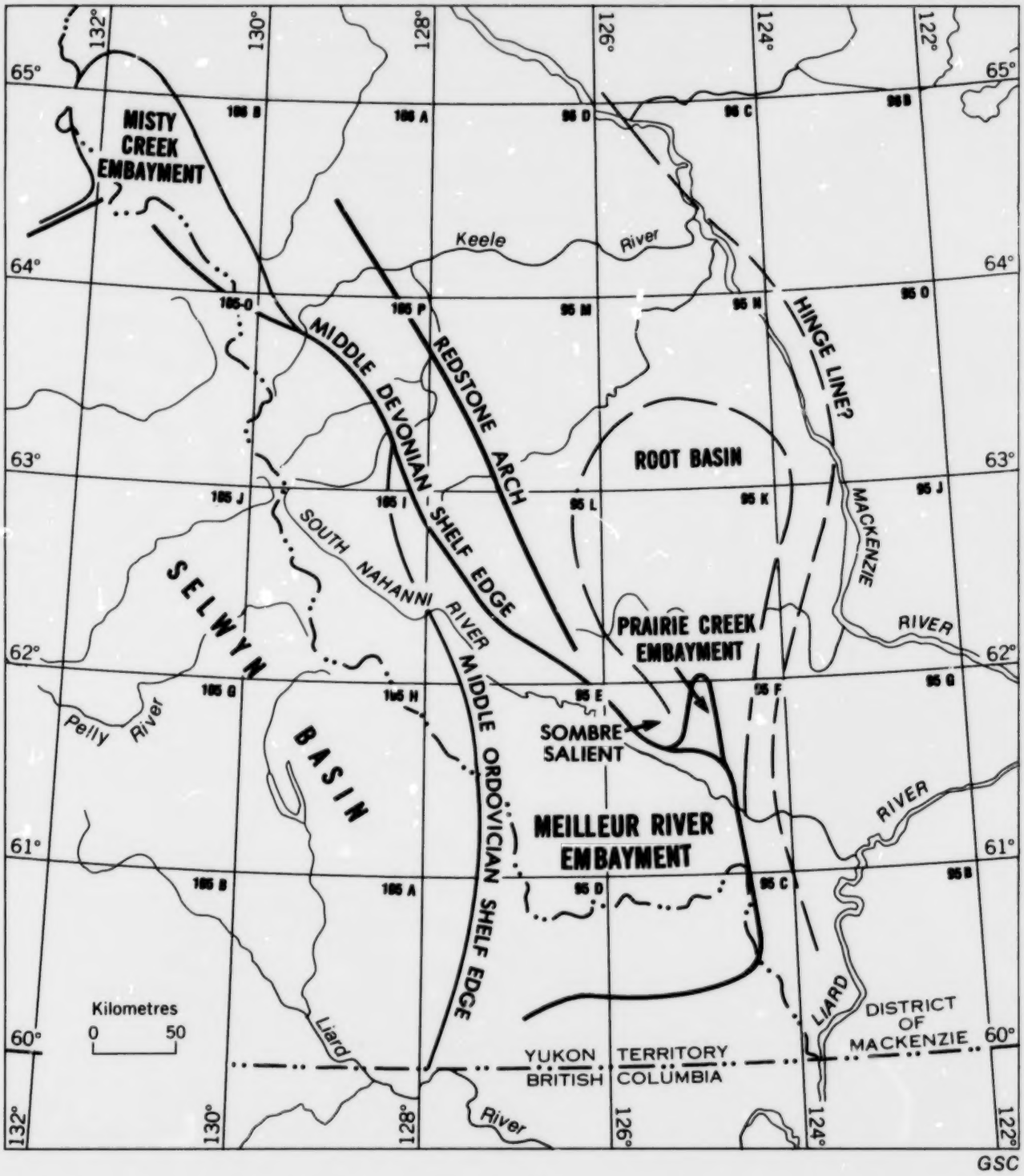


Figure 4. *Tectono-sedimentologic elements of the Mackenzie Shelf in early Paleozoic time. In Early Devonian time the region of deeper water deposition represented by Root Basin had shrunk to the small area shown as Prairie Creek Embayment. The region of the Meilleur River Embayment was an area of basinal shale deposition throughout Late Ordovician to Middle and Late Devonian time. The Middle Ordovician edge is the basinward limit of the Sunblood Formation platform carbonates (i.e. the Sunblood Platform) underlying the Meilleur River Embayment shales.*

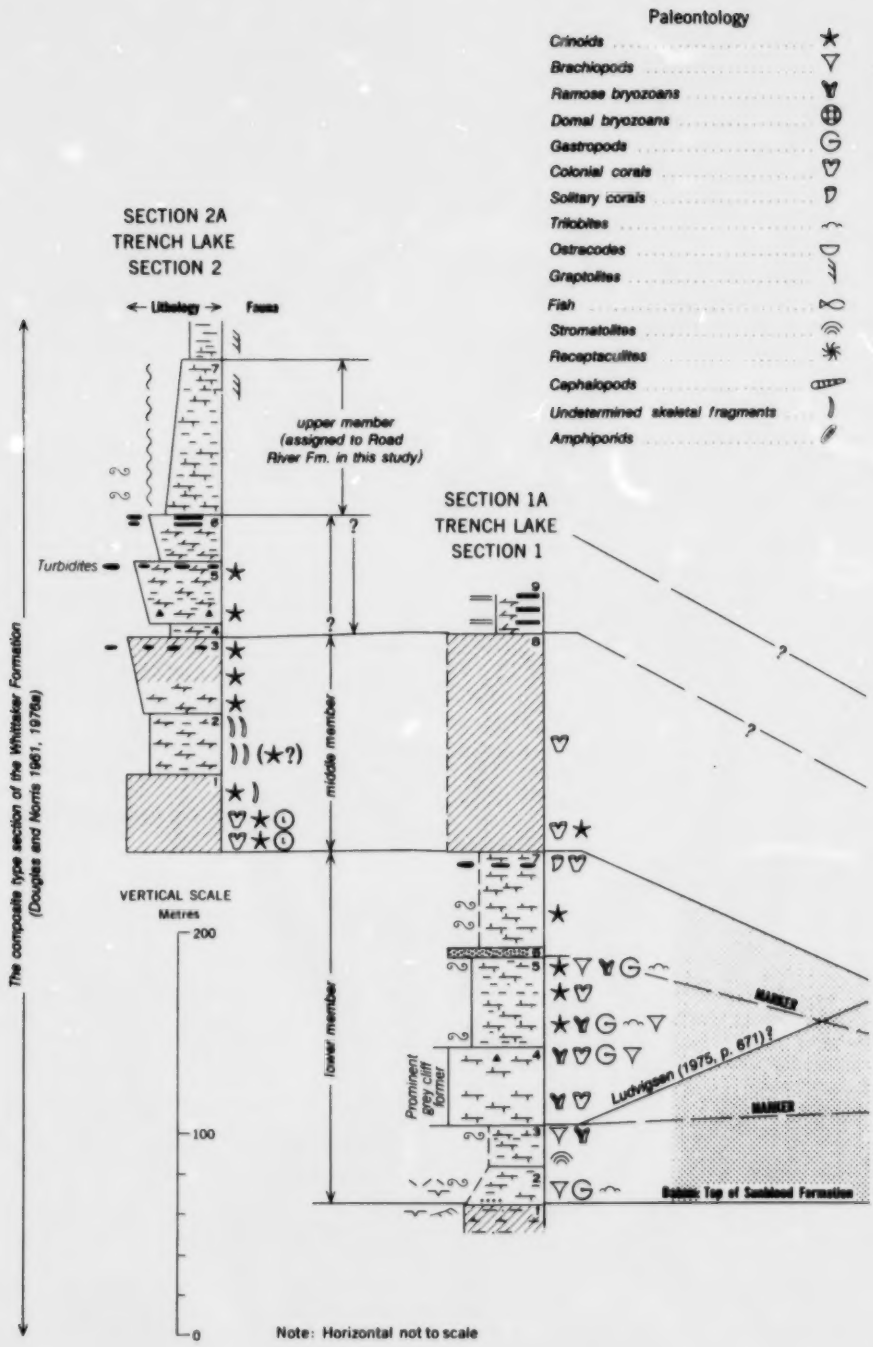
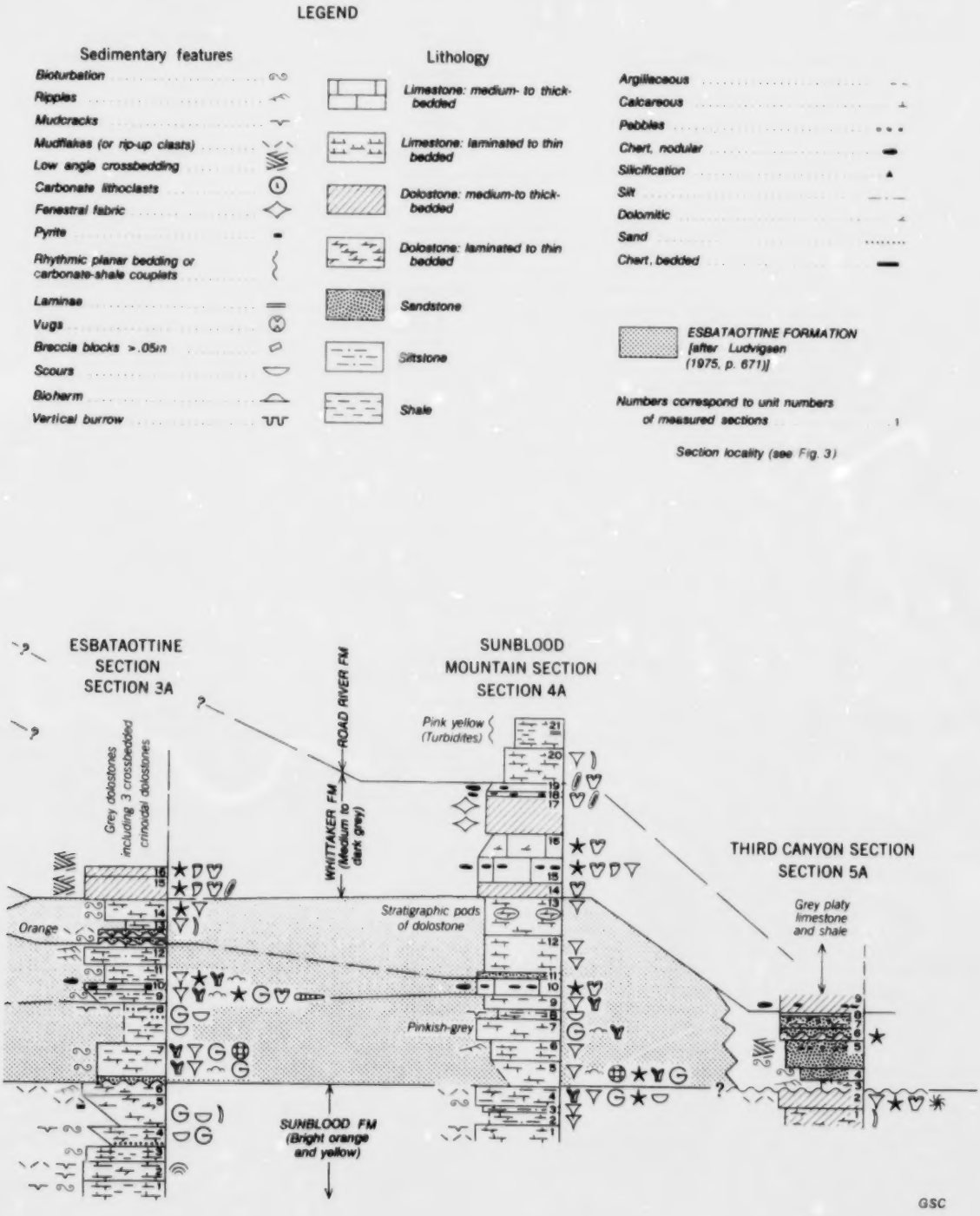


Figure 5. *Stratigraphic cross-section of Ordovician strata in the Root River (95K) and Virginia Falls (96F) map areas. The entire lower member of the Whittaker Formation (Douglas and Norris, 1961), is considered here to be in lithostratigraphic continuity with the Esbataottine Formation.*


LEGEND
Sedimentary features
Bioturbation
Ripples
Mudcracks
Mudflakes (or rip-up clasts)
Low angle crossbedding
Carbonate lithoclasts
Fenestral fabric
Pyrite
Rhythmic planar bedding or carbonate-shale couplets
Laminae
Vugs
Breccia blocks >.05m
Scours
Bioherm
Vertical burrow
Lithology
Limestone: medium- to thick-bedded
Limestone: laminated to thin bedded
Dolostone: medium-to thick-bedded
Dolostone: laminated to thin bedded
Sandstone
Siltstone
Shale
Argillaceous
Calcareous
Pebbles
Chert, nodular
Silicification
Silt
Dolomitic
Sand
Chert, bedded
ESBATAOTTINE FORMATION [after Ludvigsen (1975, p. 671)]
Numbers correspond to unit numbers of measured sections
Section locality (see Fig. 3)
ESBATAOTTINE SECTION SECTION 3A
SUNBLOOD MOUNTAIN SECTION SECTION 4A
THIRD CANYON SECTION SECTION 5A
ROAD RIVER FM
WHITTAKER FM (Medium to dark grey)
SUNBLOOD FM (Bright orange and yellow)
Grey dolostones including 3 crossbedded crinoidal dolostones
Orange
Pink yellow (Turbidites)
Stratigraphic pods of dolostone
Pinkish-grey
Grey platy limestone and shale
GSC

CHAPTER II

SUNBLOOD PLATFORM

Introduction

The Sunblood Formation, which forms the Sunblood Platform (Fig. 2) was not studied systematically, but the writers' observations are consistent with those of Ludvigsen (1975) who regarded the Sunblood as a shallow water deposit including some intertidal beds. The carbonate platform deposits of the Sunblood extend across the Virginia Falls map area and pass laterally to shales of the Road River Formation on the west side of the Flat River map area (NTS 95E) west of Virginia Falls (Gabrielse et al., 1973). Ludvigsen (1975, p. 691) has suggested that the Redstone Arch, a major Devonian tectonic element (Gabrielse, 1967), may have been active during Ordovician and Silurian time, so that north of the Virginia Falls area the Sunblood accumulated only in the region of the Root Basin and on the narrow shelf west of the Redstone Arch, which he interpreted to have been emergent at that time. The writers have no evidence to contribute to this hypothesis, as the pertinent area of inferred Middle Ordovician exposure lies northwest beyond the Virginia Falls area. For the purpose of this study strata of the Sunblood Formation can be regarded as having formed a uniform shallow water platform that marks the base of the overlying Ordovician-Devonian sequence, which we examined in detail.

Sunblood Formation

Introduction

The Sunblood Formation (mOS) was defined by Kingston (1951) as simply the Ordovician strata that can be mapped along the South Nahanni River more than 100 km upstream from Virginia Falls, and he designated a type section on Sunblood Mountain (Fig. 3). The stratigraphic position of both the upper and lower contacts of the Sunblood have been revised several times (Douglas and Norris, 1960; Ludvigsen, 1975; Douglas and Norris, 1976a). In this study the writers are primarily concerned with the upper contact and accept the position of the upper contact as designated by Douglas and Norris (1960) and Ludvigsen (1975). This contact is drawn at the top of a bright, orange coloured limestone which forms the crest of Sunblood Mountain (Douglas and Norris, 1960, p. 5). This contact marks a very distinct upward lithologic change from brightly coloured, medium- to thick-bedded, resistant Sunblood limestones to darker coloured, recessive, thin bedded limestones of the Esbataottine Formation of Ludvigsen (1975, p. 670). The writers agree with Ludvigsen (1975) that this is the best choice for a mappable upper contact of the Sunblood Formation and regard Douglas and Norris's (1961, 1976a) and Gabrielse et al.'s (1973) inclusion of beds above this contact in the Sunblood Formation as less desirable (see Morrow, 1982).

Lithology, distribution and thickness

The Sunblood Formation is exposed extensively in the Virginia Falls map area. It is predominantly yellow- and orange-weathering, thin bedded, fossiliferous and argillaceous lime wackestone and dolostone (Fig. 5). The formation weathers pink and orange due to colour mottling by pockets of argillaceous material, and has an upper sandy division. It is widely distributed throughout the Mackenzie Mountains north of the study area (Douglas and Norris, 1960, 1961, 1963; Gabrielse et al., 1973). Although the type section of the Sunblood Formation is in the Virginia Falls map area, the lowermost beds of this formation are not exposed in the type locality. In a more completely exposed section at Flood Creek in the Flat River map area, where both upper and lower contacts are exposed, Gabrielse et al. (1973) reported a 4710 foot (1437 m) thick section and designated it as a standard reference section of the Sunblood. Ludvigsen (1975) restricted the thickness of strata assignable to the Sunblood to the lower 1003 m of this reference section. We tentatively concur with Ludvigsen's assignment. It is evident that the lithostratigraphy of the Sunblood Formation and associated strata are in need of further work.

Contact relationships, age and correlation

At the type area the Sunblood is overlain abruptly but conformably by the thin Esbataottine Formation (Ludvigsen, 1975). The Sunblood exposed along the north and south sides of Third Canyon and along Prairie Creek is overlain abruptly and conformably by the lower argillaceous limestone member (muOWl) of the Whittaker Formation (Fig. 81, in pocket; Fig. 6). The trilobite and brachiopod faunas of the Sunblood indicate a Middle Ordovician age (Whiterock-Chazyan) (Ludvigsen, 1975).

It is difficult to be certain of the regional relationships between the Sunblood, Esbataottine and Whittaker formations. We favour the hypothesis that the Esbataottine Formation in the Sunblood Mountain area is a lithologically mappable continuation of the lower argillaceous limestone member (muOWl) of the Whittaker Formation in the Third Canyon and Prairie Creek areas (Morrow, 1982; figs. 5, 6). Farther north, in the Root River map area, Ludvigsen (1975, p. 670) assigned a portion of the lower part of the type Whittaker Formation to the Esbataottine Formation. However, our examination of the type sections of the Whittaker Formation and the Esbataottine Formation indicates that the Esbataottine is in lithostratigraphic continuity with the entire fossiliferous limestone sequence of the lower part of the Whittaker Formation at the type section, and that the base of the type Whittaker Formation as

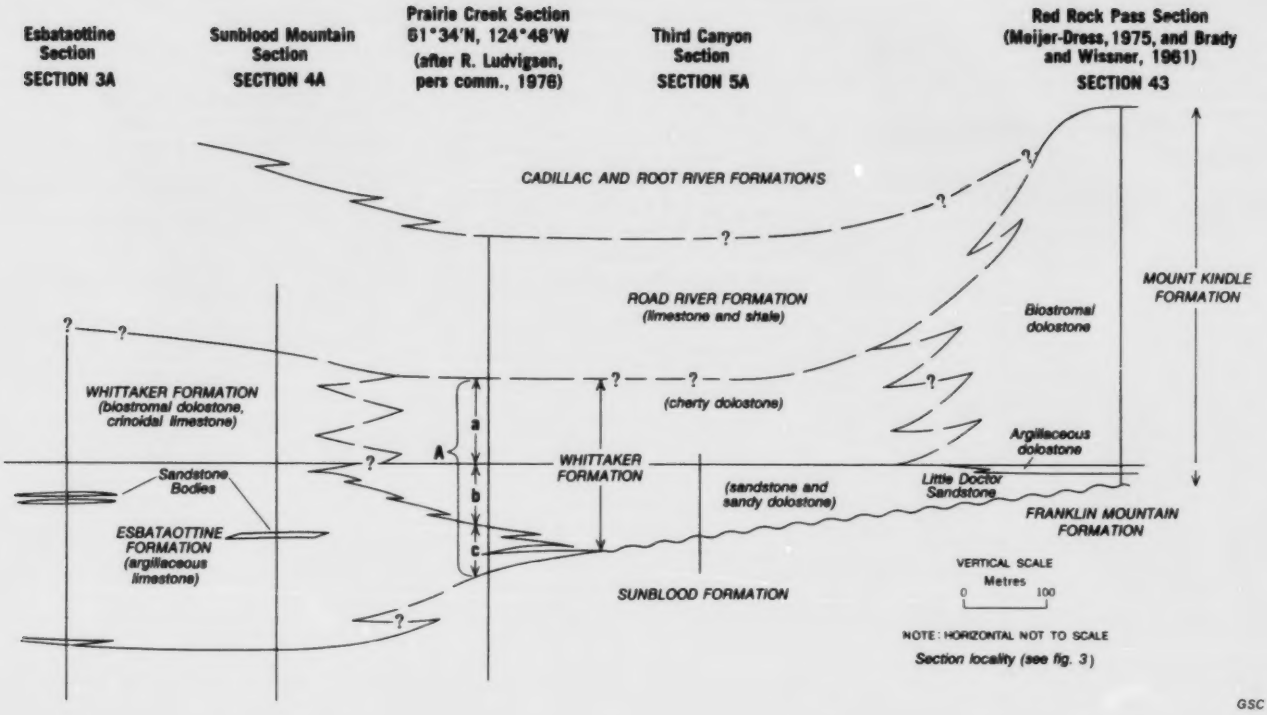


Figure 6. *An east-west cross-section showing a possible correlation between lithofacies within the Mount Kindle Formation in the Sibbeston Lake map area, the three lithofacies of the Whittaker Formation in the Virginia Falls map area, and the overlying tongue of Road River shale. The argillaceous and sandy basal zone of the Mount Kindle Formation may correlate with the argillaceous limestone* (muOW1) *and dolomitic* (muOW2) *facies of the Whittaker Formation. The sequence bracketed in 'A' represents the sequence mapped in the region around Prairie Creek (Fig. 81, in pocket) so that 'a' represents* (muOW1) *, 'b' represents* (muOW2) *and 'c' represents* OSW3 *.*

originally defined by Douglas and Norris (1961) is the same age as the base of the Esbataottine Formation at its type section (figs. 5, 6; Morrow, 1982).

Ludvigsen (1975, 1978) has indicated that the Esbataottine, in its type area near Sunblood Mountain, is partly correlative with the upper part of the Sunblood Formation as mapped by Douglas and Norris (1960) in the Mary Range southwest of Third Canyon on the South Nahanni River (Fig. 81, in pocket). If this is true it may indicate that the deepening that marked the onset of post-Sunblood sedimentation progressed toward the Mary Range at a rate slow enough to permit the accumulation of some shallow water, mudcracked, peritidal Sunblood sediment in that area, while very fossiliferous predominantly subtidal Esbataottine sediments accumulated in the Sunblood Mountain region. The faunal data of this study indicate, however, that the top of the Sunblood Formation is a synchronous surface throughout the region between Sunblood Mountain and the Whittaker type section in the Root River map area (Fig. 5).

The base of the Sunblood is not exposed in Virginia Falls map area but, in the adjoining Flat River map area, the Sunblood conformably overlies the Broken Skull Formation (Gabrielse et al., 1973). The Sunblood passes laterally to shales of the Road River Formation in the western part of the Flat River map area (NTS 95E). In the Nahanni Range, the Mount Kindle Formation, largely correlative with the Whittaker Formation, unconformably overlies the Cambrian and Early Ordovician Franklin Mountain Formation (Meijer Drees, 1975a; Norford and Macqueen, 1975). Thus, the Middle Ordovician Sunblood Formation is not represented by strata in the Nahanni Range and the period of Sunblood deposition is represented instead by the unconformity at the top of the Franklin Mountain (Fig. 6). This unconformity extends westward up to Third Canyon, and the middle sandstone member (muOW2) that rests on the unconformity surface at Third Canyon (figs. 5, 6) probably can be correlated with the Little Doctor sandstone (Meijer Drees, 1975b) at the base of the Mount Kindle Formation in the Nahanni Range.

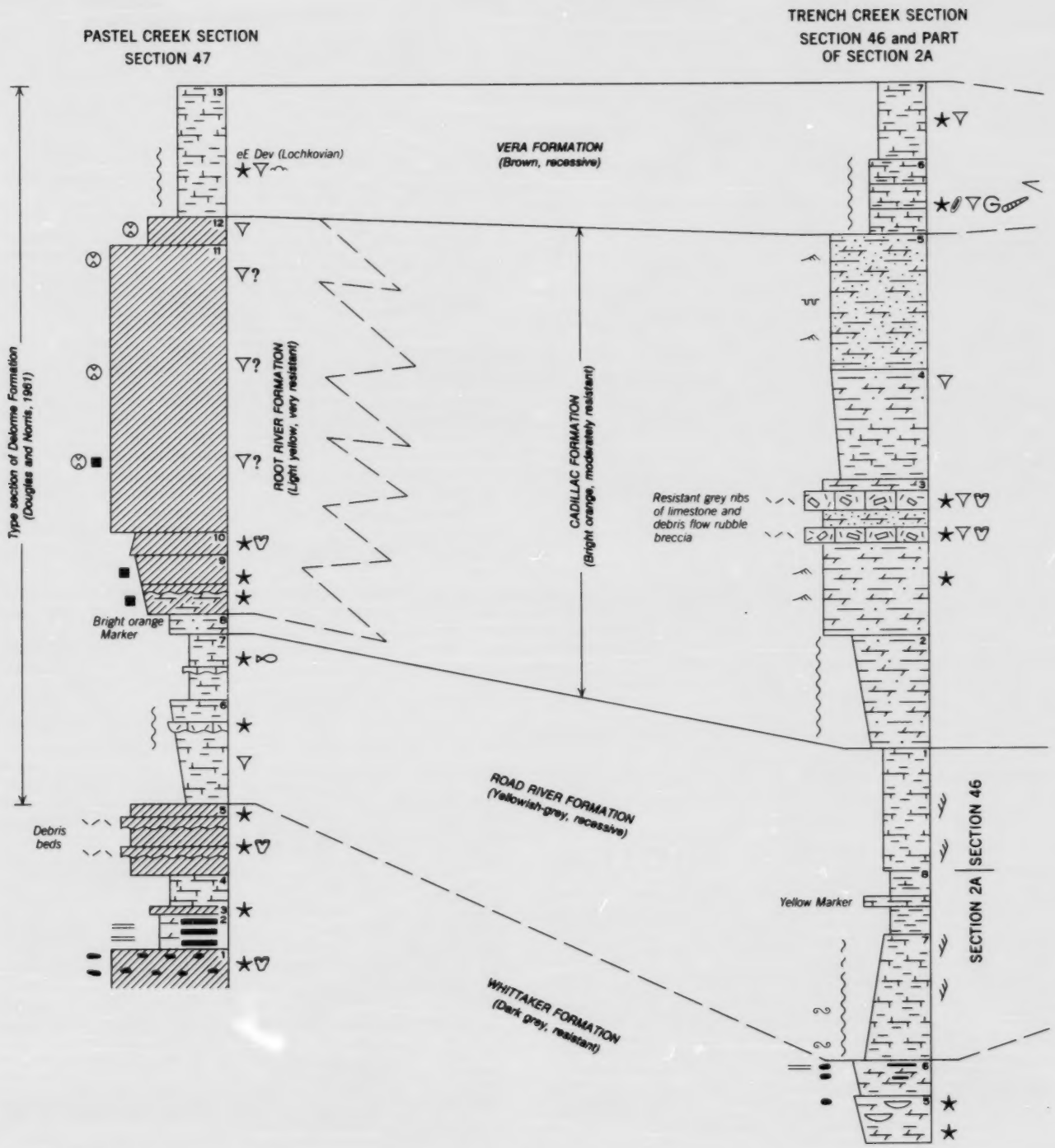
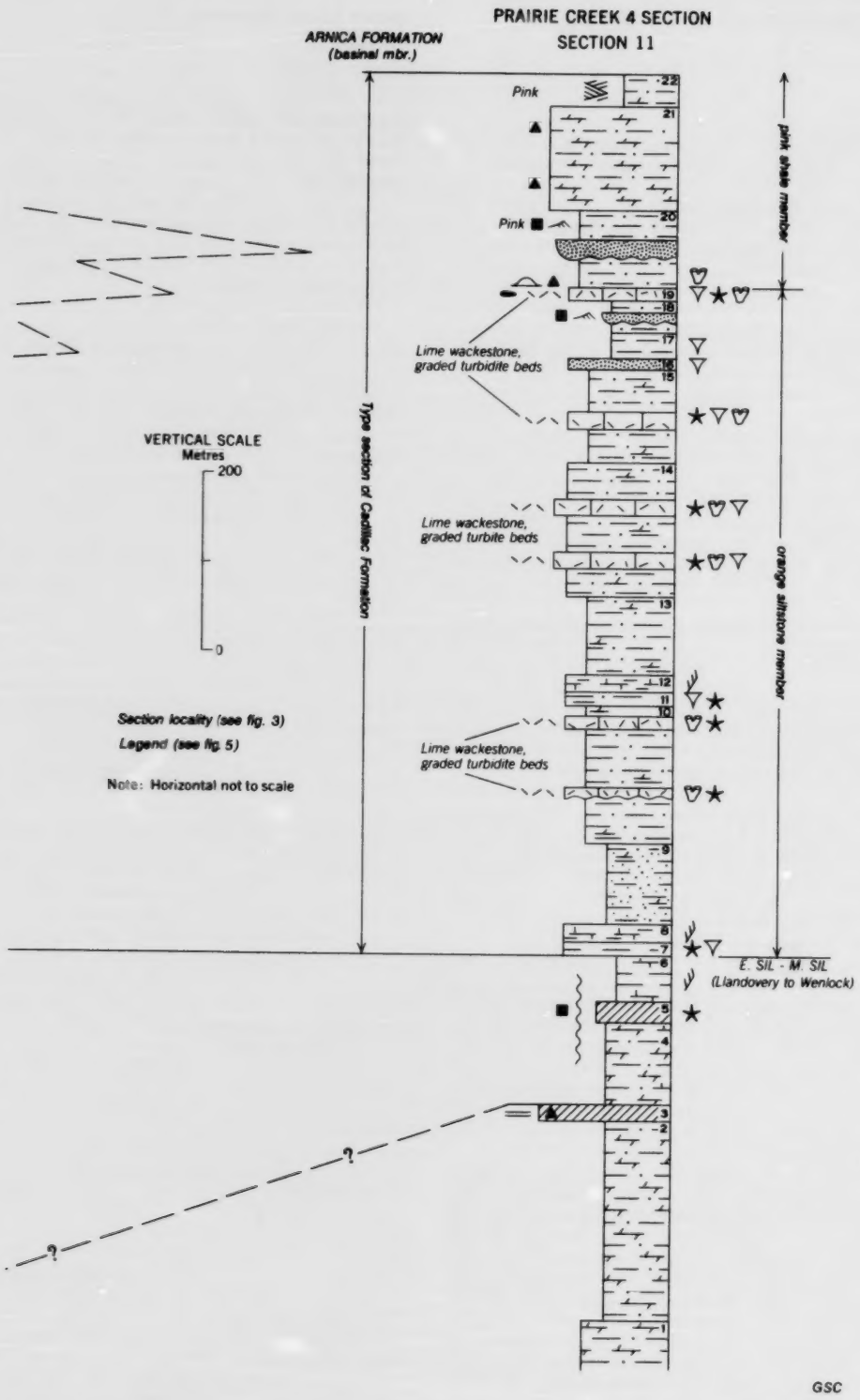


Figure 7. *A stratigraphic cross-section of Silurian-Devonian strata in the Root River and Virginia Falls map areas. The Pastel Creek Section (Sec. 46) is the type section of the former Delorme Formation (Douglas and Norris, 1961), which has been subdivided here into the Road River, Root River, Vera and Cadillac formations. Section 46, in this study, is designated as the type section of the Root River Formation. Legend as in Figure 5.*


PRAIRIE CREEK 4 SECTION
SECTION 11
ARNICA FORMATION
(basinal mbr.)
Pink
Pink
Lime wackestone, graded turbidite beds
Lime wackestone, graded turbite beds
Lime wackestone, graded turbidite beds
Type section of Cadillac Formation
pink shale member
orange siltstone member
E. SIL - M. SIL
(Llandovery to Wenlock)
VERTICAL SCALE
Metres
200
0
Section locality (see fig. 3)
Legend (see fig. 5)
Note: Horizontal not to scale
GSC

THE MOUNT KINDLE-ROOT RIVER ASSEMBLAGE

Introduction

The Mount Kindle-Root River assemblage was initiated by an abrupt, major transgression that followed deposition of the platform carbonates of the Sunblood Formation. This caused the shelf edge to retreat eastward and northward, forming the Meilleur River Embayment and the Root Basin. The thick- to very thick-bedded, brown, coralline shelf dolostones of the Mount Kindle Formation pass westward from the shelf into the thin- and medium-bedded, cherty, deeper water, dark grey dolostones and limestone of the Whittaker and Esbataottine formations in Root Basin, along a facies transition that is located slightly east of the boundary between the Virginia Falls (95F) and Sibbeston Lake (95G) map areas (Fig. 6).

The position of this facies boundary is approximate because these strata are not exposed in the Mackenzie Plain on the west side of the Sibbeston Lake map area. The Mount Kindle Formation crops out at the base of the Nahanni Thrust (Red Rock Pass Section - Sec. 43 in Appendix 3), but is not exposed farther west in the Sibbeston lake map area, although the Pan Am A-1 Mattson Creek well provides one additional section of the Mount Kindle Formation in the subsurface slightly west of the Nahanni Range. The correlative strata of the Whittaker Formation in Root Basin are not exposed farther east than the eastern border of the Virginia Falls map area.

The Whittaker Formation in the Virginia Falls map area is overlain conformably by a tongue of Road River Formation shales. These brown, calcareous shales are present also in the type areas of the Whittaker and Delorme formations of Douglas and Norris (1961), the Whittaker and the Delorme ranges respectively in the Root River map area (95K) north of Virginia Falls (Fig. 7). These shales were assigned by Douglas and Norris (1961) to the basal part of their Delorme Formation and to the upper part of their Whittaker Formation. We have separated these shales from the Delorme and Whittaker formations of previous usage and regard them as a tongue of the thick Road River shale succession in the Selwyn Basin extending northward and eastward into Root Basin (figs. 4, 5). The eastern limit of this Road River shale tongue is not exposed, and it is not present in the Nahanni Range. It is possible that part of this tongue has a facies contact with the underlying Whittaker-Kindle and possibly with the overlying Root River Formation (new formation - previously part of the Delorme Formation) such that the tongue thins progressively eastwards (Fig. 6). Faunal data from these units are consistent with this interpretation; for example the shallow water carbonates of the Root River Formation, at the Root River shelf edge in Section 25 (figs. 8, 9), may be Middle Silurian in age (Niagaran or Wenlock to earliest Ludlow) whereas the Road River shale tongue in Section 10 is of late Early Silurian to Middle Silurian age (Llandovery to Wenlock) (Fig. 10). It can be inferred that part of the Root River Formation may have been deposited contemporaneously with this Road River tongue.

The Road River tongue probably underlies the Root River Formation in the Virginia Falls map area as it does farther north in the Root River map area. There is some faunal evidence to suggest that the entire Root River Formation is in fact equivalent to a very small part of the combined Road River-Cadillac terrigenous sequence immediately west of the Root River shelf edge in the Prairie Creek area (Fig. 11).

Mount Kindle Formation

The Late Ordovician to Early Silurian Mount Kindle Formation (Williams, 1922, 1923; revised by Norford and Macqueen, 1975) was examined briefly. It is exposed only along the east side of the Nahanni Range (Red Rock Pass Section) but also occurs in the Pan Am A-1 Mattson Creek well. The biostratigraphy and lithostratigraphy of the Mount Kindle Formation throughout the Mackenzie Mountains has been extensively described by Norford and Macqueen (1975) and, in the subsurface east of the Mackenzie Mountains, by Meijer Drees (1975a).

The Mount Kindle Formation in the type section at Mount Kindle has been divided informally into three units by Norford and Macqueen (1975). These include: a thin basal member of argillaceous dolostone and dark shale; a resistant middle biostromal member of dark brown coralline and stromatoporoidal dolomite; and an upper, more recessive, dolostone member containing brachiopods, crinoids, and a few scattered corals and stromatoporoids. These subdivisions are well developed in the only complete published section of the Mount Kindle Formation in the study area, the Red Rock Pass Section (Sec. 43) in the Nahanni Range. The basal argillaceous unit at the Red Rock Pass Section is 74 m thick. It contains a basal marine sandstone interval 45 m thick, termed the Little Doctor sandstone, which is developed locally above the unconformity at the base of the Mount Kindle Formation in the region between 61° and 63° north latitude (Meijer Drees, 1975b). The remainder of the section is more resistant, with a coralline and stromatoporidal basal part and an upper crinoidal and brachiopodal part, as in the type section.

The basal sandstone of the Mount Kindle Formation at Red Rock Pass rests unconformably on brightly coloured Cambrian and Ordovician dolostones of the Franklin Mountain Formation (Meijer Drees, 1975b). In turn, the Mount Kindle Formation is overlain unconformably by sandy and silty dolostones of the Silurian Dolomite map unit of Douglas and Norris (1976b). West of the Nahanni Range, the Mount Kindle Formation passes into the Whittaker Formation and, possibly, into the tongue of Road River shale that overlies the Whittaker Formation. The Mount Kindle Formation is, in essence, the shallow water, reefal facies equivalent of the deeper water dolostones of the Whittaker Formation and shales of the lower part of the Road River tongue.

Whittaker Formation

Introduction

The name Whittaker Formation (muOW1, 2 and OSW3 in Fig. 81, in pocket) was proposed by Douglas and Norris (1961, p. 7) for a sequence of thin bedded, dark grey limestones, dolostones and shales that is exposed extensively throughout the Mackenzie Mountains (Douglas and Norris, 1961, 1962; Gabrielse et al., 1973; and Ludvigsen, 1975). The type section of the Whittaker is on the east side of the Whittaker Anticline near Trench lake in the Road River map area (Douglas and Norris, 1961, p. 7; Fig. 5).

It should be noted that Douglas and Norris have not included the Whittaker Formation as a map unit in their recent map of the Virginia Falls map area (Douglas and

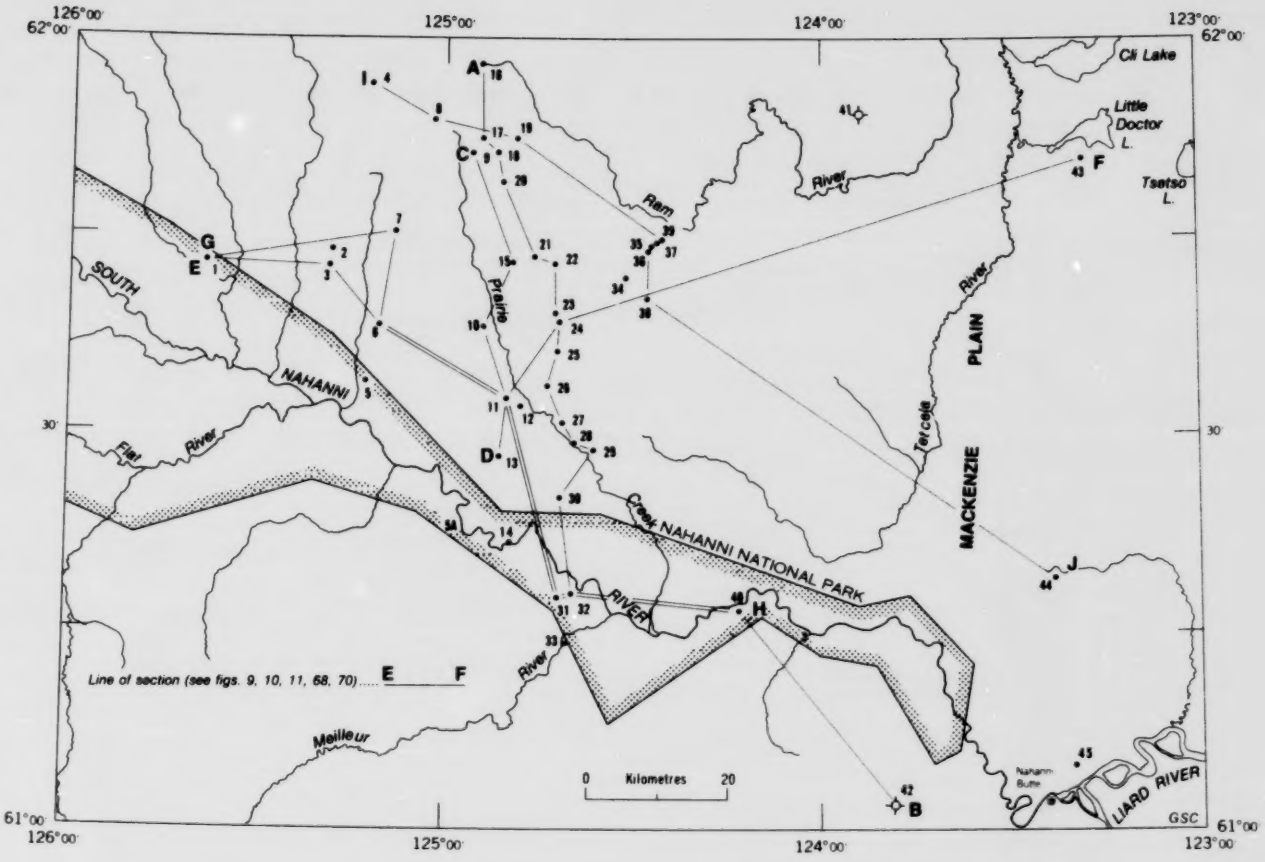


Figure 8. *Locations of stratigraphic sections in the Virginia Falls and Sibbeston Lake map areas and the lines of section for the stratigraphic cross-sections shown in figures 9, 10, 11, 68 and 70. For detailed information concerning the sections, see Appendix 3.*

Norris, 1976a). However, this map is a departure from their earlier version (Douglas and Norris, 1960). Map unit 3 in the 1960 edition has no counterpart in the 1976a map but appears to represent the Whittaker Formation as mapped in this study (Fig. 81, in pocket). Douglas and Norris (1961, p. 7, 12) previously stated that the Whittaker strata mappd in the Root River map area are structurally continuous with map unit 3 of the Virginia Falls map area (Douglas and Norris, 1960). Ludvigsen (1975) considered that map unit 3 (Douglas and Norris, 1960) represents the combined Esbataottine and Whittaker formations in the Virginia Falls map area. The writers concur with this view, particularly with regard to the Whittaker Formation.

Lithology, distribution and thickness

The Whittaker Formation was not examined systematically in the Virginia Falls area and only five incomplete sections of the Whittaker were measured. Observations made during mapping, and consultations in the field with Ludvigsen, permitted subdivision of the Whittaker exposed around Prairie Creek into three lithofacies: a lowermost division, about 50 m thick, of dark grey, silty and sandy limestone; a middle unit of white to dark grey dolomitic sandstone and pure quartzarenite sandstone, about 75 m thick; and an uppermost unit of thin bedded, dark grey, cherty dolostone, about 100 m thick. These three divisions are mapped in ascending stratigraphic order as muOW1, muOW2, and OSW3 respectively (Fig. 6; Fig. 81 in pocket) in the central part of the Virginia Falls map area. These subdivisions have not been mapped in the region south of the South Nahanni River, although they are known to be present (Sec. 5A).

The middle sandy subdivision is distinctively more resistant and thicker bedded than the overlying and underlying subdivisions. This sandy facies of the Whittaker Formation probably occurs only in the Virginia Falls map area and has not been noted in other parts of the Mackenzie Mountains. It may be contiguous with, and a westward continuation of, the Little Doctor sandstone (Meijer Drees, 1975b) at the base of the Mount Kindle Formation in the Red Rock Pass area of the Nahanni Range and farther east (Fig. 6).

In the eastern part of its area of outcrop around Prairie Creek the Whittaker ranges in thickness from about 200 to 300 m. West of Prairie Creek, in the region around Sunblood Mountain, the combined thickness of the Whittaker and Esbataottine formations is about 400 m (Fig. 5) and both of these units pass to shale of the Road River Formation in the southwest part of the Virginia Falls map area.

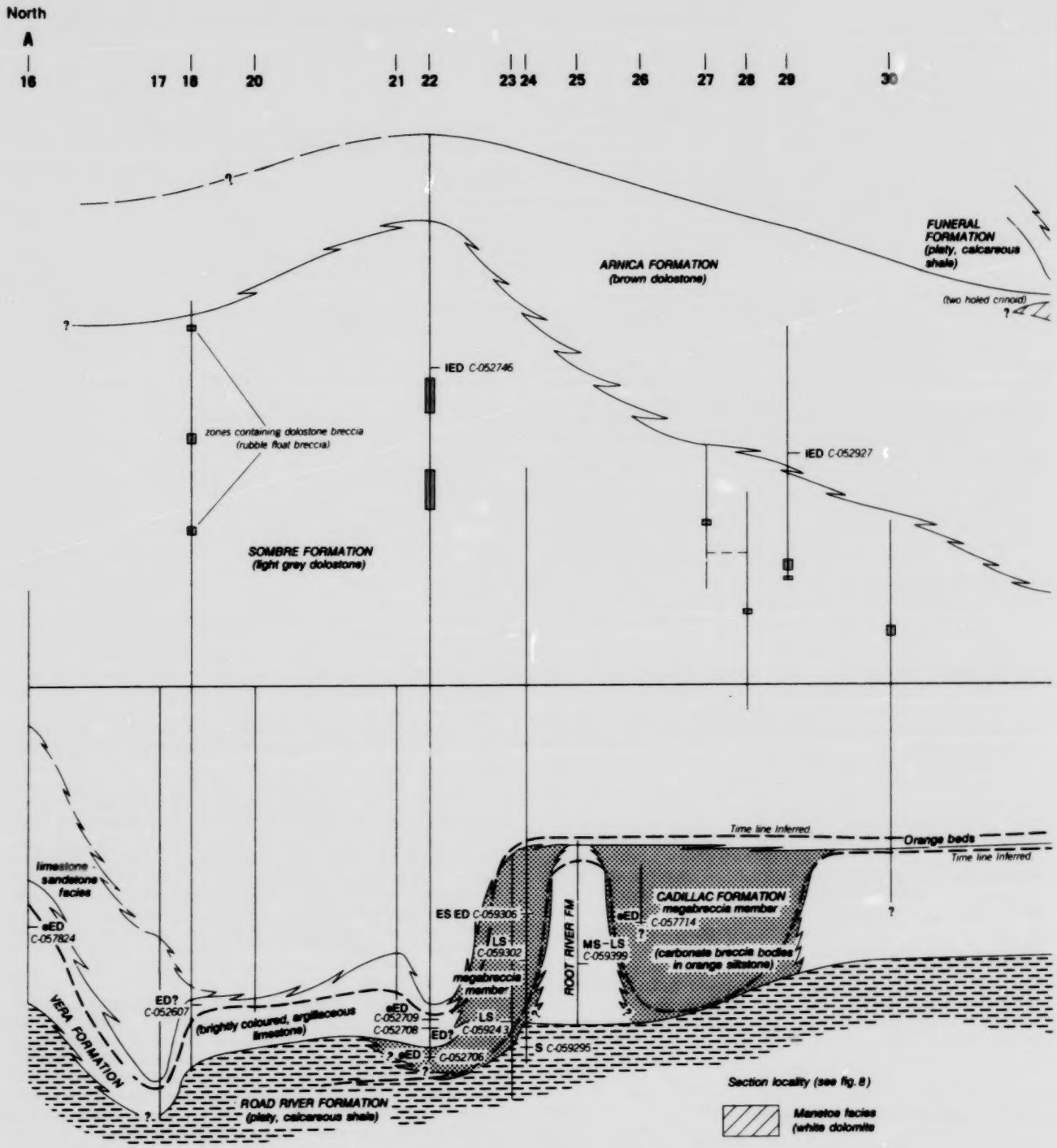
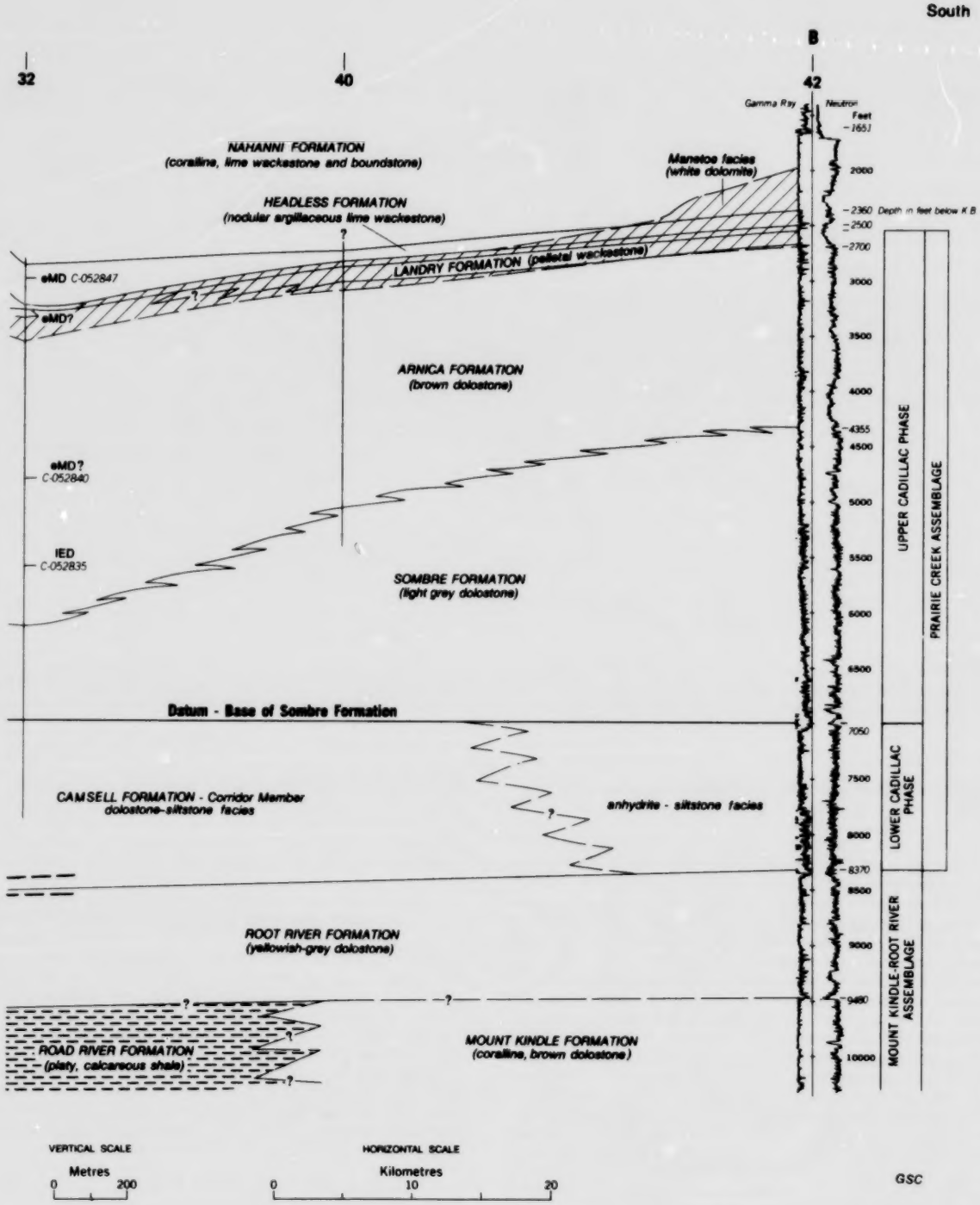


Figure 9. *A stratigraphic cross-section of Silurian to Middle Devonian strata of the Mount Kindle-Root River and Prairie Creek assemblages along the line of section A-B in Figure 8. The southern end of the line of section is the Pan Am A-2 Mattson Creek well and the section extends northward along the Tundra Range, which forms the hanging wall of the Tundra Thrust. The inferred time lines are consistent with the faunal data.*


South
B
32
40
42
Gamma Ray
Neutron
Feet
1651
2000
2360
Depth in feet below K B
2500
2700
3000
3500
4000
4355
4500
5000
5500
6000
6500
7050
7500
8000
8370
8500
9000
9480
10000
NAHANNI FORMATION
(coralline, lime wackestone and boundstone)
Manetoe facies
(white dolomite)
HEADLESS FORMATION
(nodular argillaceous lime wackestone)
LANDRY FORMATION (pellet/ wackestone)
eMD C-052847
eMD?
ARNICA FORMATION
(brown dolostone)
eMD?
C-052840
IED
C-052835
SOMBRE FORMATION
(light grey dolostone)
Datum - Base of Sombre Formation
CAMSELL FORMATION - Corridor Member
dolostone-siltstone facies
anhydrite - siltstone facies
ROOT RIVER FORMATION
(yellowish-grey dolostone)
ROAD RIVER FORMATION
(platy, calcareous shale)
MOUNT KINDLE FORMATION
(coralline, brown dolostone)
UPPER CADILLAC PHASE
LOWER CADILLAC PHASE
PRAIRIE CREEK ASSEMBLAGE
MOUNT KINDLE-ROOT RIVER ASSEMBLAGE
VERTICAL SCALE
Metres
0
200
HORIZONTAL SCALE
Kilometres
0
10
20
GSC

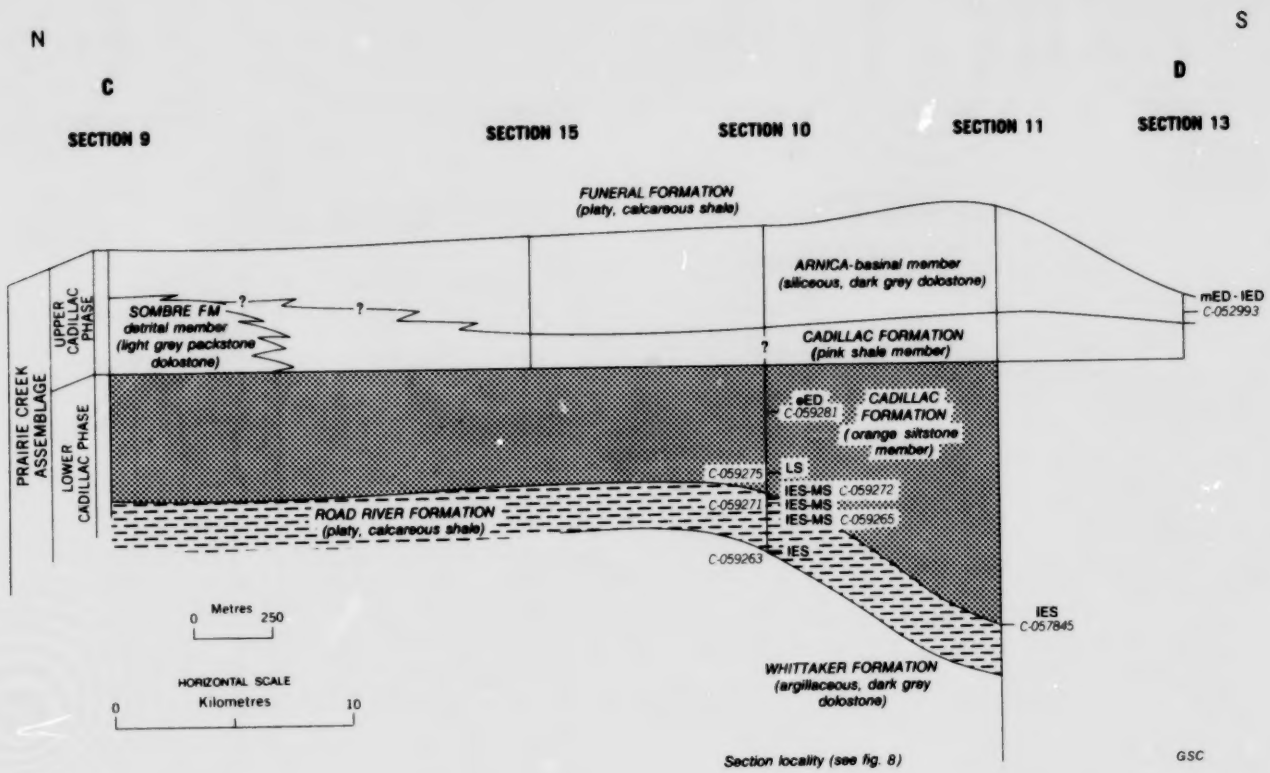


Figure 10. *A stratigraphic cross-section of the Prairie Creek assemblage along the line of section C-D in Figure 8. The cross-section extends approximately north-south through the slope and basin sediments of the Prairie Creek Embayment.*

Contact relationships, age and correlation

The Whittaker Formation rests unconformably on the Sunblood Formation in the eastern part of the Virginia Falls map area and is conformably overlain by the Road River shale tongue (Fig. 5). The basal unit of the Whittaker is a sandstone which contains dolostone fragments or pebbles reworked from the underlying Sunblood Formation. In the western part of the Virginia Falls map area, the lowermost subdivision of the Whittaker Formation, as mapped in this study but which has been named the Esbataottine Formation by Ludvigsen (1975), rests with a sharp but conformable contact on the Sunblood Formation. The Whittaker must pass westward into Road River shale and eastward into thick bedded, reefal dolostone of the Mount Kindle Formation (Fig. 6), although neither transition can be observed directly in the study area. Like the Mount Kindle Formation, the Whittaker Formation ranges in age from late Ordovician to Early Silurian (Ludvigsen, 1975). If, as previously mentioned, the middle sandy dolomite and quartzite subdivision (muOW2) of the Whittaker Formation, found around Prairie Creek, correlates with the Little Doctor sandstone subunit at the base of the Mount Kindle Formation (Fig. 6), then the lowermost argillaceous limestone subdivision of the Whittaker (muOW1) and the Esbataottine Formation may be correlated, in large part or totally, with the time interval represented by the unconformity at the base of the Little Doctor sandstone and with the sandstone unit itself (Fig. 6).

Road River Formation

Introduction

The name Road River Formation (SDR) (Jackson and Lenz, 1962) originally was applied to a thick sequence of graptolitic shales and argillaceous limestones of Ordovician and Silurian age in the Richardson Mountains, but this name now is applied to rocks spanning the Late Cambrian to Early Devonian interval (Lenz and Pedder, 1972). Gabrielse et al. (1973) applied the name Road River to similar shale sequences in the southern Mackenzie Mountains in map areas immediately west of the study area, and Ludvigsen (1975), in a paper dealing with Ordovician stratigraphy of the southern Mackenzie Mountains, indicated that the Road River Formation extends into the Virginia Falls area as a shale tongue above the Whittaker Formation.

Douglas and Norris (1976a) did not identify the Road River Formation in their recent map of the Virginia Falls map area. Instead, they mapped a more comprehensive unit, labelled OSD (Ordovician, Silurian, Devonian undivided), which also includes strata that have been mapped as Whittaker, Road River, Cadillac or Vera formations (Fig. 2) in this report. Shales and argillaceous limestones of the Road River Formation extend northward and eastward underneath the Root River Formation in the Virginia Falls and Root

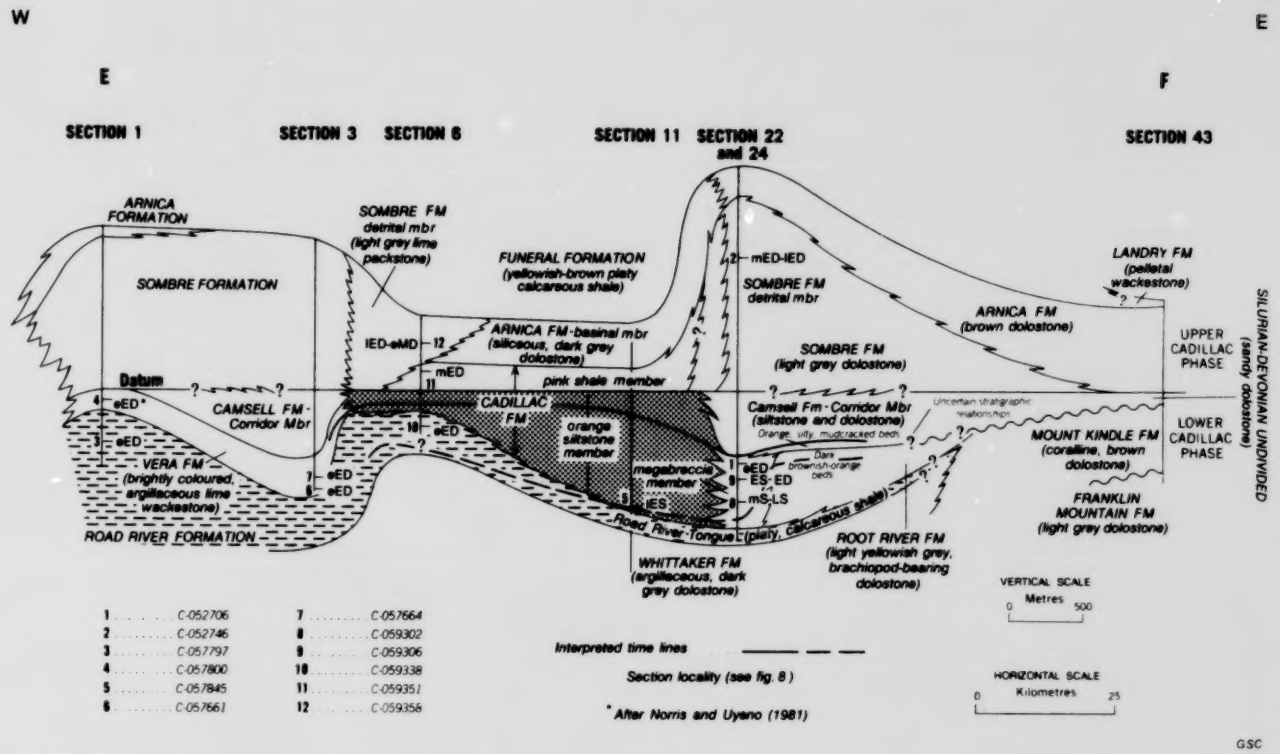


Figure 11. *A stratigraphic cross-section of the Mount Kindle-Root River and Prairie Creek assemblages along the line of section E-F in Figure 8. Units of the Prairie Creek assemblage that were deposited within the embayment are much thinner than the adjacent coeval shelf units.*

River map areas. The OSD unit mapped by Douglas and Norris (1976a) southwest of the South Nahanni River was examined only briefly by the writers, but is apparently identical to and contiguous with the Road River mapped by Gabrielse et al. (1973) in the adjacent Flat River map area (95E). It is only in the Prairie Creek area, largely north of the South Nahanni River, that Douglas and Norris (1976a) included Road River and other strata in their OSD map unit.

Complete exposures of the Road River Formation tongue are rare in the Virginia Falls area because, since this formation commonly occurs at the base of thrust plates, its lower part is not exposed (Fig. 81, in pocket). Also, vegetation has obscured many exposures, particularly in the Prairie Creek area where the Road River Formation is in contact with other terrigenous units, such as the Cadillac Formation. The best exposures occur where Silurian-Devonian shelf carbonates overlie the Road River, as along the Manetoe and Arnica ranges.

Lithology, sedimentary structures, distribution and thickness

The lower part of the Road River Formation tongue in the Virginia Falls area consists of thin bedded to laminated, brownish grey, calcareous and silty dolostone or dolomitic lime mudstone with yellow weathering argillaceous partings (Fig. 12). These thin, platy to shaly beds grade upward to a rhythmite succession in the upper part, in areas where the Road River is overlain by the Vera Formation, such as along the southern parts of the Manetoe and Arnica ranges in the Virginia Falls map area (Fig. 12). This rhythmite is composed of a very regular alternation of thin, slightly resistant, dark grey beds of argillaceous lime mudstone and very thin, recessive, greyish yellow, argillaceous and shaly partings; and is a transitional facies between the laminated, argillaceous, dolomitic limestones of the lower part of the Road River and the thin, argillaceous, brightly coloured limestones of the overlying Vera Formation.

This upper rhythmite is less well developed in areas where the Road River tongue is overlain by the Cadillac Formation, such as around the type section of the Cadillac near Prairie Creek (Fig. 13). In these areas, the upper part of the Road River is merely slightly thicker bedded and less dolomitic than the lower part.

X-ray diffraction analyses of the argillaceous and dolomitic lime mudstones of the Road River Formation indicate that they contain about 10 to 20 per cent of clay minerals, mainly illite but with some chlorite; about 15 per cent quartz silt and the remaining 65 to 75 per cent is dolomite or calcite (Table 2). Small amounts of feldspar are present also with greater amounts of quartz in samples from the westernmost sections, such as Section 1 and Section 6 (Table 2).

TABLE 2. Chemical and mineralogical analyses

Sample No.	C - Number	Formation	Section or Location	Height above base (Below Top) in metres	% Fe_2O_3	ppm Pb	ppm Cu	ppm Ni	ppm Mn	ppm Cr	ppm Ba	ppm Zn	Total Carbon (per cent)	Carbonates (per cent)		Silicates (per cent)		Clay Minerals (per cent)		
														Calcite	Dolomite	Quartz	Feldspar	Illite	Kaolinite	Chlorite
1	C-045692	Whittaker	Second Canyon Lat. 61°20'40"; Long. 124°57'40"	N/A	0.49	15	18	16	163	76	36	150	11.39		94	5		1		
2	C-059227	Whittaker	Prairie Creek 7 (12)	(77.5)	0.67	30	26	16	262	76	0	2658	11.42	Trace	95	4		1		
3	C-059228	Whittaker	Prairie Creek 7 (12)	(77.0)	0.85	85	41	52	181	119	46	258	10.50	1	86	10		3		
4	C-059229	Whittaker	Prairie Creek 7 (12)	(43.5)	0.94	29	30	24	543	165	14	318	8.37	2	76	21		1		
5	C-059230	Whittaker	Prairie Creek 7 (12)	(31.5)	0.83	36	30	32	152	83	63	54	10.22	2	88	6	1	3		
6	C-057842	Whittaker	Prairie Creek 4 (11)	(0.5)	1.18	43	43	27	662	353	42	36	4.33	1	49	49		1		
7	C-059231	Road River	Prairie Creek 7 (12)	(217.0)	0.16	24	20	19	113	61	0	42	10.69	Trace	77	22		Trace		
8	C-059232	Road River	Prairie Creek 7 (12)	(142.5)	0.94	43	22	16	315	84	64	24	11.28	3	90	5	1	1		
9	C-059234	Road River	Prairie Creek 7 (12)	(0.5)	1.41	24	24	24	172	79	169	42	8.58	46	29	15		10		
10	C-057769	Road River	South Manetoe 2 (5)	(117.5)	1.24	37	18	16	168	66	108	54	9.13	47	27	17	1	5		3
11	C-059294	Road River	South Tundra 6 (24)	(80.5)	1.92	11	20	25	254	71	118	18	8.15	64	5	10		13		8
12	C-059239	Road River	South Tundra 8 (23)	(1.0)	1.59	43	21	21	193	66	123	42	7.90	72	8	9		8	3	
13	C-059237	Road River	South Tundra 8 (23)	(134.0)	0.73	10	23	18	135	59	69	36	9.84	66	25	6	1	2		
14	C-057795	Road River	Cathedral Mountain (1)	(369.0)	1.89	18	23	27	286	88	551	72	8.28	40	22	16	11	7		4
15	C-057796	Road River	Cathedral Mountain (1)	(232.5)	1.24	37	18	16	168	66	108	54	9.13	56	22	14	3	4		1
16	C-057798	Road River	Cathedral Mountain (1)	(63.5)	0.91	23	17	17	129	54	55	30	9.33	67	17	9	2	5		
17	C-059266	Road River	Funeral Range 1 (10)	(108.0)	1.00	38	26	26	353	85	326	36	9.10	1	80	14	2	3		
18	C-059296	Road River	South Tundra 6 (24)	(10.5)	1.24	37	18	16	168	66	108	54	9.13	70	10	9	1	7		3
19	C-059338	Road River	South Manetoe 1 (8)	(105.0)	1.45	18	20	20	234	74	239	564	8.07	52	22	18	4	3		1
20	C-052982	Cadillac	West Headless (13)	(48.0)	1.42	33	29	41	147	121	486	96	7.76	2	73	20	2	3		
21	C-057848	Cadillac	Prairie Creek 4 (11)	29.0	2.26	101	28	41	361	144	421	438	7.26	13	43	31	3	10		
22	C-059349	Cadillac	South Manetoe 1 (8)	185.5	0.85	63	24	26	441	126	272	72	8.37	5	66	24	2	3		
23	C-059395	*Delorme*	South Tundra 7 (25)	95.0	0.15	43	26	11	157	63	0	342	10.60	1	99					
24	C-059353	*Sombre - detrital member*	South Manetoe 1 (8)	49.0	0.07	30	15	8	160	44	0	24	10.71	82	18					
25	C-053031	*Arnica*	Second Canyon 2 (31)	(3.0)	0.16	24	20	19	113	61	0	42	10.69	3	97					
26	C-059358	*Sombre - detrital member*	South Manetoe 1 (8)	147.0	0.16	73	24	19	87	79	0	48	10.72	1	92	7				
27	C-059169	*Funeral*	Prairie Creek 4 (11)	293.0	2.47	21	22	25	316	81	154	48	7.98	64	3	18	2	8		5
28	C-059171	*Funeral*	Prairie Creek 4 (11)	344.5	2.38	18	23	29	350	90	187	54	7.82	56	8	21	2	7		6
29	C-059164	*Funeral*	Prairie Creek 4 (11)	103.0	2.84	15	23	32	417	90	284	72	6.99	44	9	26	2	11		8
30	C-053037	*Headless*	Second Canyon 2 (31)	70.0	0.29	30	14	9	79	47	0	30	10.02	87	6	6		1		

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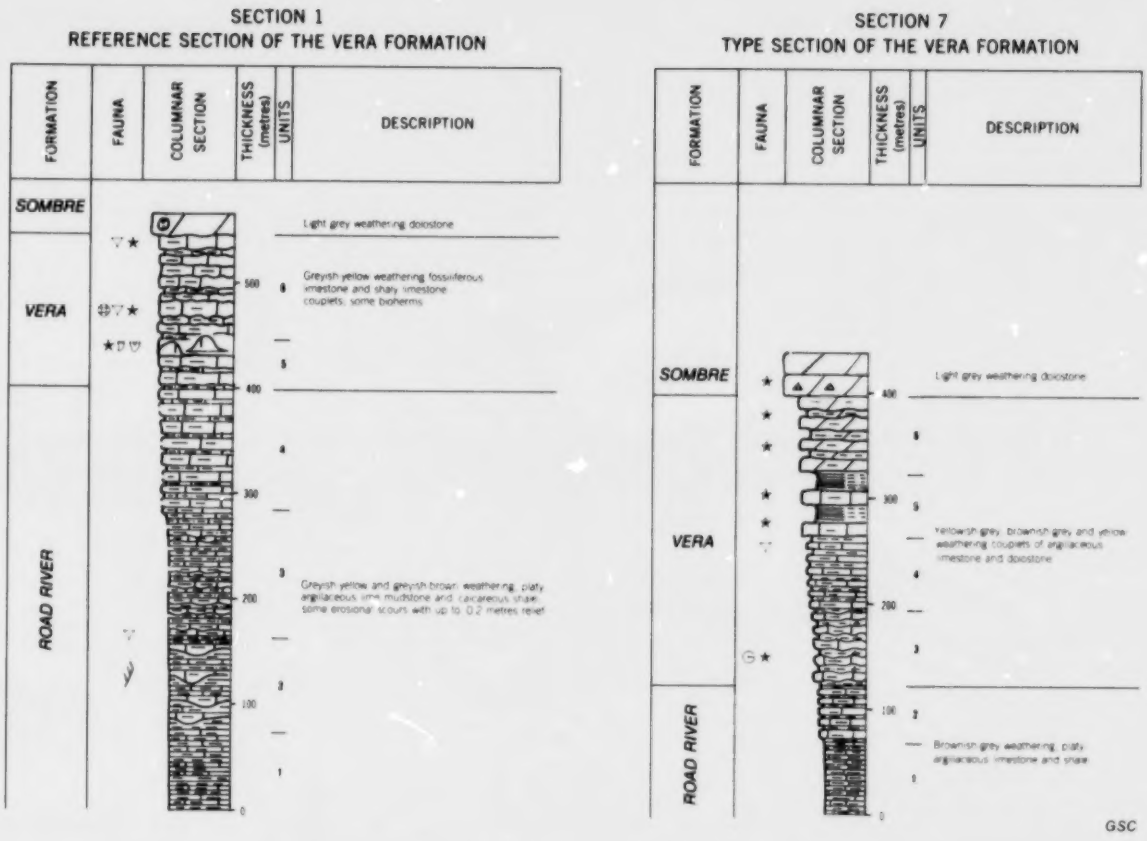


Figure 12. *Columnar sections of the Vera and Road River formations in sections 1 and 7. Note the gradational contact between the Road River calcareous shales and the overlying argillaceous lime mudstone and wackestone of the Vera Formation. Section 7 contains the type section of the Vera Formation. Legend as in Figure 13.*

The Road River is widely distributed throughout the Virginia Falls map area, but, because the base of this unit is rarely exposed it is not possible to define thickness variations (Fig. 81, in pocket). The 168 m thick section of Road River at Section 11 is probably a representative thickness for most of the Road River tongue in the Prairie Creek region. This tongue becomes thicker southwestward as it approaches the main mass of Road River, as for example in the thick and incomplete Road River sequence in Section 1 (Fig. 12).

Sedimentary structures, apart from bedding and fine laminations, are seldom observed in the thin bedded, argillaceous lime mudstone of the Road River. The rhythmic bedding in the upper part of the Road River, where it is overlain by the Vera Formation, resembles many previously described deeper water slope and basin deposits (Bissell and Barker, 1977 – Great Blue Formation; and Cook and Taylor, 1977 – Hales Limestone). Shallow water features are absent in all these sequences of rhythmically bedded lime mudstone-shale couplets. Some thicker lime mudstone beds appear to have erosional bases and have crinoid fragments concentrated in their lower parts, which may indicate that these beds originated as mass flow deposits rather than *in situ* accumulations. Erosional scours, infilled with planar laminated, argillaceous limestone or shale, occur in some parts of the lower Road River (Fig. 14). These may be slump or turbidite scour surfaces later infilled by organic rich pelagic or hemipelagic debris.

Contact relationships, age, and correlation

The upper and lower contacts of the Road River Formation are not well exposed in the Virginia Falls area but appear to be conformable and transitional with both the underlying Whittaker and overlying Vera and Cadillac formations (Fig. 11). The Road River is overlain by the Cadillac Formation in the area of Prairie Creek Embayment and by the Vera Formation in the shelf areas flanking the embayment. Moreover, it is inferred that Road River strata conformably underlie the Root River Formation in the shelf area on the east flank of the embayment, although the basal contact of the Root River was not observed in the Virginia Falls area (Fig. 11). The upper contact of the Road River becomes younger westward, from late Early Silurian (Llandovery) in the eastern Section 11 to early Devonian (Lochkovian) in the thicker Road River sequence in Section 1 to the west.

It is possible that this trend continues east of the Prairie Creek Embayment underneath the Root River Formation, so that the intertonguing contact between the Road River and Root River is older eastward. Locally, the Road River tongue probably also passes laterally into the upper part of the Mount Kindle Formation (Fig. 11). Westward this Road River tongue joins the main body of Road River shale and limestone that is exposed in the southwest part of the Virginia Falls map area and in the Flat River map area west of the Virginia Falls area.

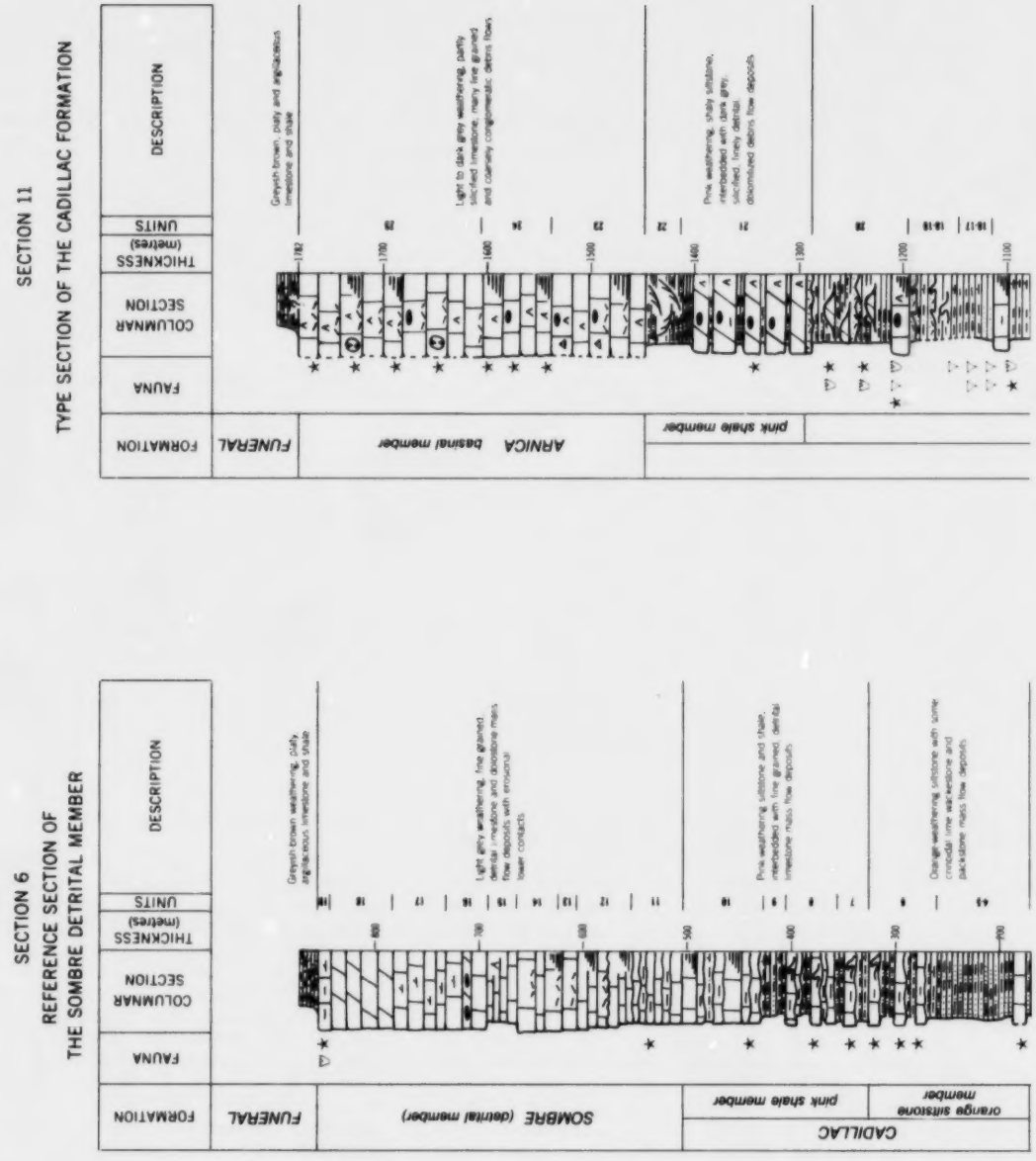
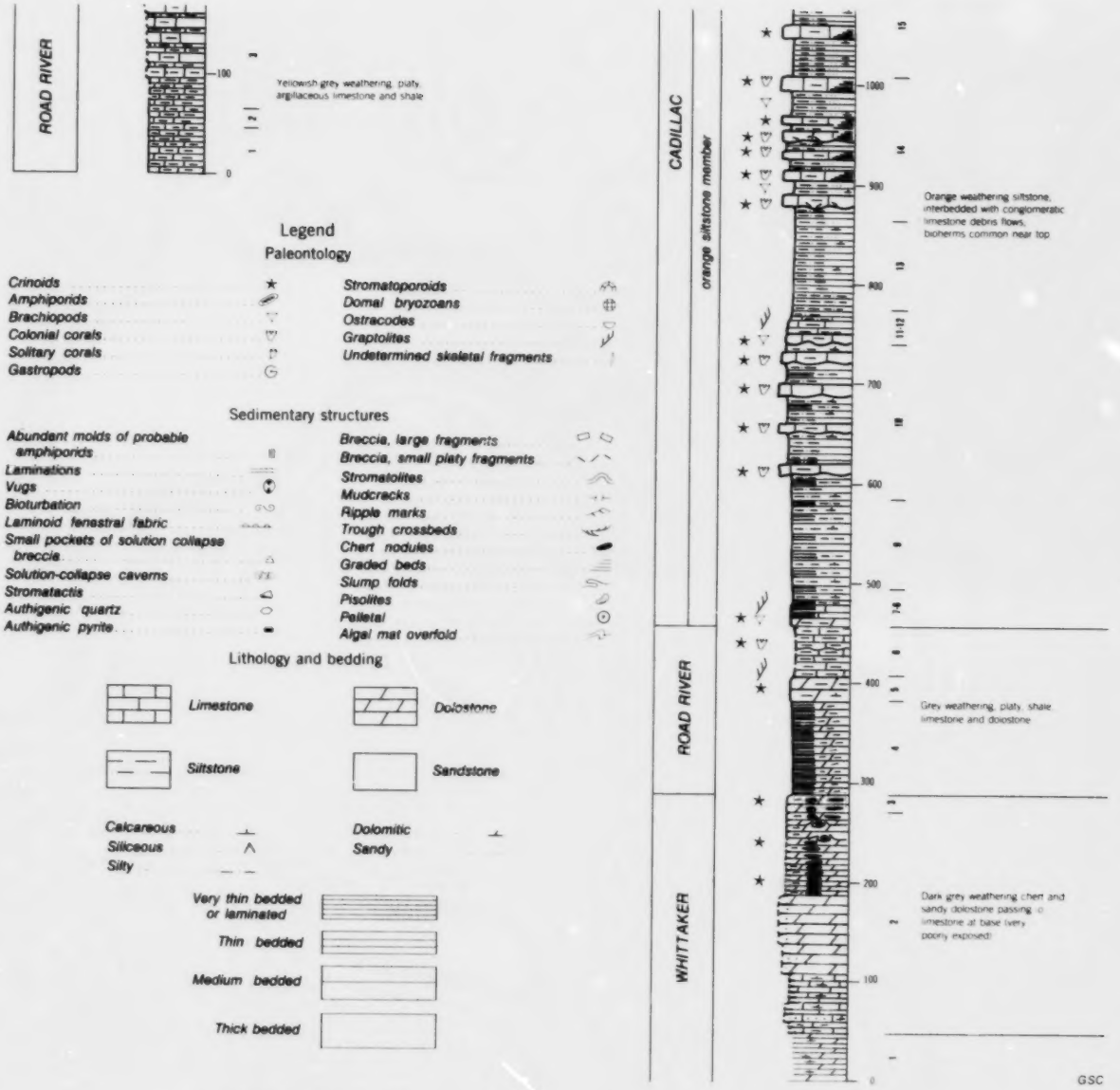

SECTION 11
TYPE SECTION OF THE CADILLAC FORMATION
DESCRIPTION
UNITS
THICKNESS (metres)
COLUMNAR SECTION
FAUNA
FORMATION
FUNERAL
ARNICA basinal member
pink shale member
Greyish brown, shaly and argillaceous limestone and shale
Light to dark grey weathering, partly silicified limestone, many fine grained and coarsely conglomeratic debris flows
Pink weathering, shaly siltstone, interbedded with dark grey, silicified, limey detrital, discontinued debris flow deposits
SECTION 6
REFERENCE SECTION OF
THE SOMBRE DETRITAL MEMBER
DESCRIPTION
UNITS
THICKNESS (metres)
COLUMNAR SECTION
FAUNA
FORMATION
FUNERAL
SOMBRE (detrital member)
CADILLAC
pink shale member
orange siltstone member
Greyish brown weathering, platy argillaceous limestone and shale
Light grey weathering, fine grained, detrital limestone and dolostone mass flow deposits with erosional lower contacts
Pink weathering siltstone and shale, interbedded with fine grained, detrital limestone mass flow deposits
Orange weathering siltstone with some crinoidal lime wackestone and packstone mass flow deposits

Figure 13. *Columnar sections of Late Silurian-Early Devonian strata in the Prairie Creek Embayment, including the Road River and Cadillac formations and the Sombre detrital and Arnica basinal members. Section 11 contains the type section of the Cadillac Formation.*



Legend for figs 12, 15 & 47

The faunal content, mainly graptolites, indicates that this Road River tongue ranges in age within the Early Silurian (late Llandovery to Wenlock) on the east side of Prairie Creek. As previously discussed, the Road River on the west side of the embayment is as young as Early Devonian (Lochkovian) (Fig. 11). The most common graptolites found include *Monograptus* ex gr. *M. priodon* (Bronn), *Monograptus* ex gr. *M. spiralis* (Geinitz) and *Cyrtograptus* sp. Other faunal elements identified include some brachiopods (rare) and conodonts (Appendix 2).

Root River Formation (new name) and Silurian-Devonian Undivided

Introduction - the stratigraphic problem of the Delorme

The Delorme Formation, as originally defined by Douglas and Norris (1961, p. 10) in the Root River map area, includes four distinct lithologic facies. The uppermost and lowermost of these facies are developed throughout the Virginia Falls and Root River map areas but the intervening two facies are laterally equivalent and are less extensive, so that the Delorme Formation of Douglas and Norris (1961) resembles a sandwich with the two more extensive facies enclosing the two less extensive facies.

The extensive lowermost facies is a recessive, yellowish grey weathering, argillaceous limestone and shale sequence that has been assigned to the tongue of the Road River Formation discussed previously. Above this lowermost shale unit, at the type locality of the Delorme Formation, on Pastel Creek in the Delorme Range in the Root River map area, is a 511.5 m thick sequence that consists mainly of light grey to white weathering, massive and resistant, finely to medium crystalline dolostones that are sparsely porous and vuggy. Rocks of this facies are not laterally extensive and occur only in certain specific localities in the southern Mackenzie Mountains. Another major facies is developed in the Delorme Formation of Douglas and Norris (1961) in areas adjacent to these localities. In these areas, such as in the Whittaker Range in the Root River map area, a 658 m thick sequence of bright orange weathering, thin bedded and platy, dark grey dolomitic siltstone and silty dolostone, with limestone debris flow deposits, overlie the basal shale sequence in place of the thick bedded white dolostones. Overlying both of these facies is the laterally extensive, uppermost facies of the Delorme Formation, a recessive, orange-grey and greenish grey weathering, thin bedded, argillaceous, skeletal lime mudstone and wackestone. Brachiopods are particularly abundant in parts of the facies.

On the basis of these facies variations the writers have subdivided that part of the Delorme Formation of Douglas and Norris (1961), which is above the basal shale sequence, into three new formations: the Root River, the Cadillac and Vera. The Root River Formation is composed of a resistant light grey dolostone as exposed at the type section (Fig. 7), whereas the Cadillac Formation is composed of the adjacent orange, dolomitic siltstones, and the Vera Formation comprises the extensive, upper, recessive, green and orange striped, argillaceous limestones. In the Virginia Falls map area, rocks of the Cadillac Formation (Fig. 81, in pocket) were mapped previously as part of an Ordovician, Silurian and Devonian undivided unit, and as part of the Sombre Formation exposed around Prairie Creek (Douglas and Norris, 1976a). The Vera Formation in the Virginia Falls map area was mapped previously as Delorme Formation along Tundra Ridge, and as Ordovician, Silurian and Devonian undivided, toward the south end of the Manetoe and Arnica ranges (Douglas and Norris, 1976a). The Root River Formation was mapped as Delorme Formation in a small area south of Tundra Ridge and along the Headless Range (Fig. 81, in pocket).

The Delorme Formation with its heterogeneous assemblage of facies, as previously mapped by Douglas and Norris (1961, 1976a), is, therefore, a broadly defined term for a package of rocks sandwiched between the much more homogeneous and regionally extensive Whittaker, Camsell and Sombre formations in the Mackenzie Mountains. It may be desirable to raise the Delorme Formation to group status for the purpose of more regional studies, but in this report it is regarded as an obsolete name and is replaced here by the new formation names of Root River, Cadillac and Vera and by part of the Road River Formation.

Lithology, sedimentary structures, distribution and thickness

Rocks of the Root River Formation (SDRT), corresponding to our revised definition, crop out only in two small areas of the Virginia Falls map area (Fig. 81, in pocket). In the northern occurrence, at Section 25, the Root River is more than 500 m thick (Fig. 15) and is composed of resistant, cliff-forming, medium to thick beds of light yellowish grey dolostone. Thicker beds are fossiliferous and vuggy and contain scattered colonial corals, abundant brachiopods and, in some cases, abundant amphiporids (Fig. 15). Some more massive beds may be biostromal or even reefal, populated with abundant molds of a robust brachiopod, possibly *Trimerella ohioensis* Meek (Fig. 16). Small, but distinct stratigraphic mounds that may have been patch reefs or reef mounds, formed largely of these trimerellid brachiopods, occur commonly in the lower part of Section 25 (figs. 15, 17). Overlying beds tend to drape over these mounds as evidence of their relief during deposition. Figure 18 is a close view of a typical trimerellid-like brachiopod in one of these small mounds. Thinner beds commonly contain shallow water features such as fine laminations and fenestral fabric (Fig. 15). The upper 30 m of Section 25 contains some dark orange-grey and brown, sooty and argillaceous, thin, unevenly bedded dolostones (Fig. 15), which may be correlated in part with the Vera Formation farther north along Tundra Ridge. This is inferred because both the Vera and Root River formations are overlain by the Camsell Formation.

The small area of outcrop of the Root River Formation around Section 25 forms part of the hanging wall of the Tundra Thrust. The westward-directed salient in the Tundra thrust may reflect a rather abnormal thickness of relatively competent Root River dolostone at this point (Fig. 81, in pocket).

The only other area of Root River outcrop (Fig. 9; Fig. 81, in pocket) occurs directly south of this area along the east side of the Headless Range around Section 30. Here, the exposed thickness of the Root River Formation is less than 200 m. This may be close to its total thickness along the North Headless Fault, because the fault plane probably coincides with the contact between the Root River Formation and the relatively incompetent underlying Road River. The Root River at this locality is largely light yellowish grey, medium bedded, finely crystalline dolostone that is unfossiliferous and slightly silty.

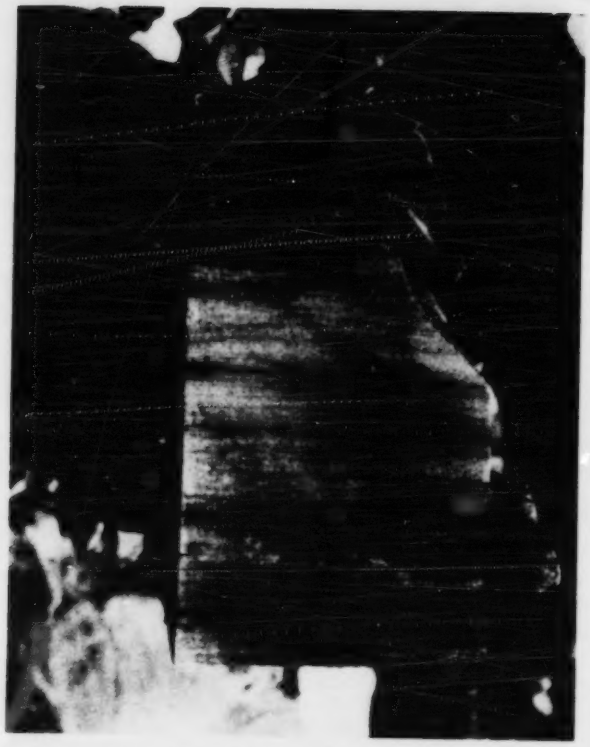


Figure 14. *Erosional contact, with dark brown, organic-rich shales or argillaceous lime mudstones overlying a scour surface on light brown or yellowish brown shale. Possibly, a turbidite scour surface was covered by pelagic or hemipelagic detritus and organic material. 232.5 m beneath the top of the Road River Formation in the Cathedral Mountain Section (Sec. 1) (ISPG Photo No. 837-127).*

Rocks that the writers have tentatively identified as Root River also occur in the subsurface in the Pan Am A-1 Mattson Creek well (Fig. 9). There, the Root River is a yellowish orange, slightly silty, finely crystalline dolostone similar to the Root River exposed along the Headless Range. The well section is thinner than the maximum exposed thickness in Section 25. Therefore, it can be speculated that the Root River thins eastward beneath the Camsell Formation and perhaps is truncated beneath the Mackenzie Plain by the sub-Devonian unconformity (Fig. 11).

At the north end of the Nahanni Range in the Red Rock Pass area (Sec. 43; Fig. 11) a sequence of sandy dolostone, 89.5 m (293 ft) thick, overlies the Mount Kindle Formation and underlies the Arnica Formation. The writers have examined this sequence, although not as a measured section, and observed shallow water or peritidal features throughout, such as dololaminites with stromatolitic undulations, shrinkage cracks, fenestral fabric and texturally mature quartzarenite sands. This sequence is the Sd or Silurian dolomite map unit of Douglas and Norris (1976b) but the true age of this sandy unit is indeterminate, as was noted first by Brady and Wissner (1961). N.C. Meijer Drees (1975a, p. 18) has suggested that this sandy dolostone is the basal part of the Devonian sequence that farther east rests with a pronounced unconformity on the Ordovician-Silurian succession and with a less pronounced unconformity in the Franklin Mountains. Douglas and Norris (1961) measured a thickness of 79 m (260 ft) for this unit at Red Rock Pass whereas Brady and Wissner (1961), in a more detailed section, measured 89.5 m (293 ft) (Sec. 41). In another section farther north, at Cli Lake, they measured 89 m (292 ft) in this unit.

Contact relationships, age and correlation

The Root River Formation overlies the Road River tongue conformably in the Root River map area and is inferred to overlie the Road River tongue conformably in the Virginia Falls map area. It is possible that there may be some degree of facies equivalence between the lower part of the Root River and the uppermost beds of the underlying Road River (Fig. 11). Westward, the Root River passes into a very thin sequence of orange, dolomitic siltstones at the base of the orange siltstone member of the Cadillac Formation in the area around sections 10 and 11. The basal part of the orange siltstone member passes westward into the thick Ordovician to Devonian Road River shale sequence in the southwestern part of the Virginia Falls map area, as at Section 1 (Fig. 11). In a nearby section of Road River shale on Clearwater Creek, Lenz (1980) measured 124 m of Lower Silurian (104 m - Llandovery; 20 m - Wenlock) shale, indicating that the entire Silurian system is represented in the OSD map unit (i.e. Road River) of Douglas and Norris (1976a) in the northwest part of the Virginia Falls map area. The oldest age determinations for the Cadillac Formation adjacent to the Root River Formation are Late Silurian whereas the top of the Road River tongue is late Early Silurian (late Llandovery), leaving a thin undated interval at the base of the Cadillac Formation that may be correlative with part of the Root River (Fig. 11).

The eastward correlation of the Root River Formation from the Mackenzie Mountains to the Nahanni Range and into the subsurface farther east is uncertain, because there are no exposures in the intervening Mackenzie Plain area between the Mackenzie Mountains and Nahanni Range. Three possible correlations are shown in Figure 19. Figure 19a illustrates the interpretation that is favoured by Douglas and Norris in their geologic maps of the Virginia Falls and the Sibbeston Lake map areas (Douglas and Norris, 1976a, b). In their structural cross-section, A-B, across the Sibbeston Lake map area, the Camsell Formation is shown overlying the Silurian dolomite unit (Sd) and wedging out eastward between the Silurian dolomite underneath and the Arnica Formation above. The westward continuation of this cross-section into the Virginia Falls map area, along the line of section A-B, implies that Douglas and Norris regarded the Silurian dolomite (Sd) of the Sibbeston Lake map area to be contiguous with the Root River Formation (SDR) of the Virginia Falls map area, as the Silurian dolomite of the Sibbeston Lake map area passes directly westward into the Delorme Formation of Virginia Falls map area. It should be borne in mind, however, that the SDD Delorme map unit of Douglas and Norris includes strata that the writers have assigned to several new formations; the Vera and Cadillac formations as well as the Root River.

A second possible correlation is shown in Figure 19b, where the Camsell, instead of wedging out eastward, is the lateral facies equivalent of the 'Silurian-Devonian undivided'. In this scenario, the Root River (i.e. previously Delorme) wedges out under the sub-Devonian unconformity beneath the Camsell. The fine- to coarse-grained quartzarenite sandstones and peritidal carbonates in the 'Silurian-Devonian undivided' are similar to sediments in the Camsell Formation in the Mackenzie Mountains, and are unlike the Root River Formation which is only slightly silty. Also, the Early to

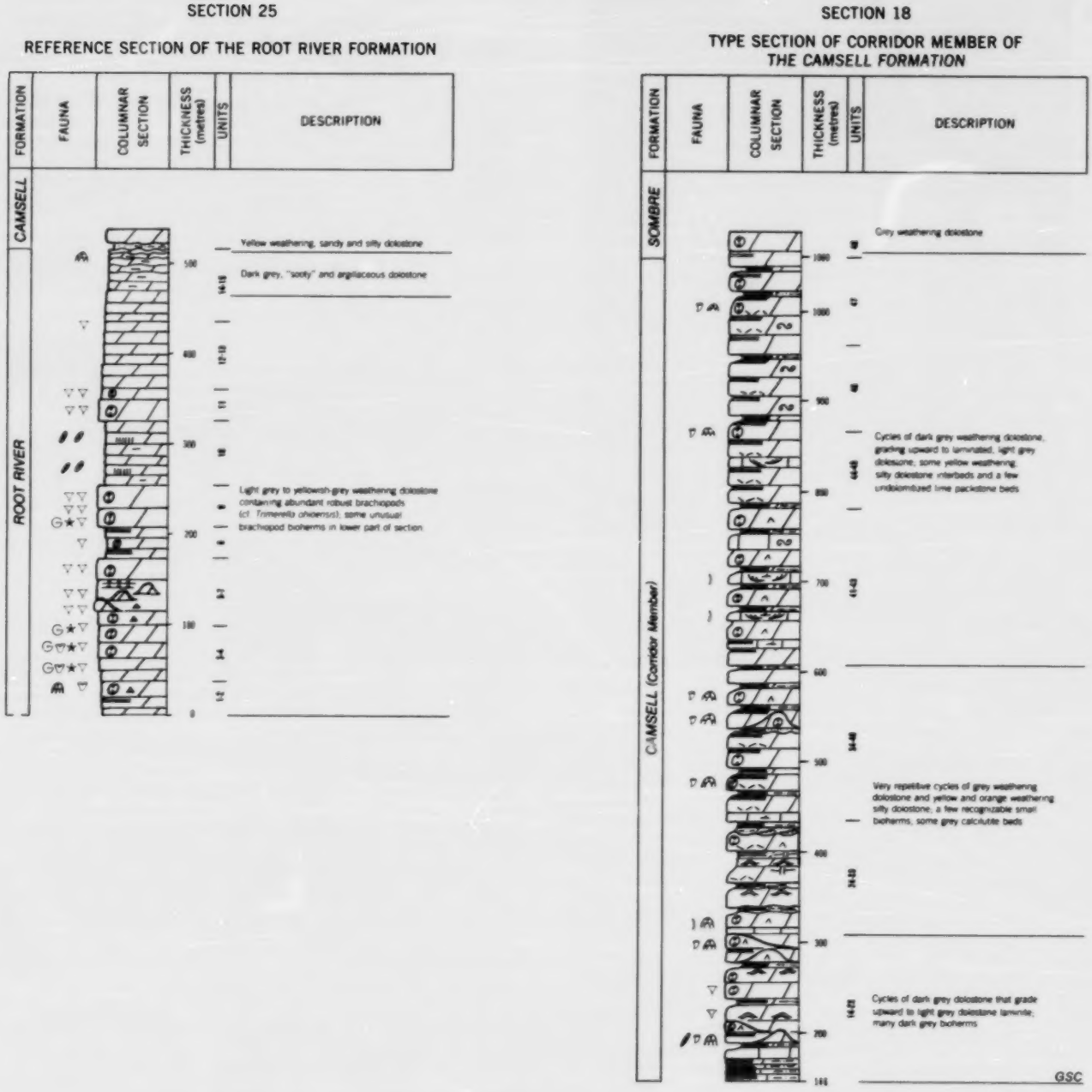

SECTION 25
REFERENCE SECTION OF THE ROOT RIVER FORMATION
FORMATION
FAUNA
COLUMNAR SECTION
THICKNESS (metres)
UNITS
DESCRIPTION
CAMSELL
ROOT RIVER
Yellow weathering, sandy and silty dolostone
Dark grey, "sooty" and argillaceous dolostone
Light grey to yellowish-grey weathering dolostone containing abundant robust brachiopods (cf. Trimerella ohioensis); some unusual brachiopod bioherms in lower part of section
SECTION 18
TYPE SECTION OF CORRIDOR MEMBER OF THE CAMSELL FORMATION
SOMBRE
CAMSELL (Corridor Member)
Grey weathering dolostone
Cycles of dark grey weathering dolostone, grading upward to laminated, light grey dolosilt one; some yellow weathering, silty dolostone interbeds and a few undolomitized lime packstone beds
Very repetitive cycles of grey weathering dolostone and yellow and orange weathering silty dolostone; a few recognizable small bioherms, some grey calcilutite beds
Cycles of dark grey dolostone that grade upward to light grey dolostone laminite; many dark grey bioherms
GSC

Figure 15. *Columnar sections of the Root River Formation (reference) and Corridor Member (type) of the Camsell Formation. Note the repetitive alternations of lithology shown here in the type section of the Corridor Member. Legend as in Figure 13.*

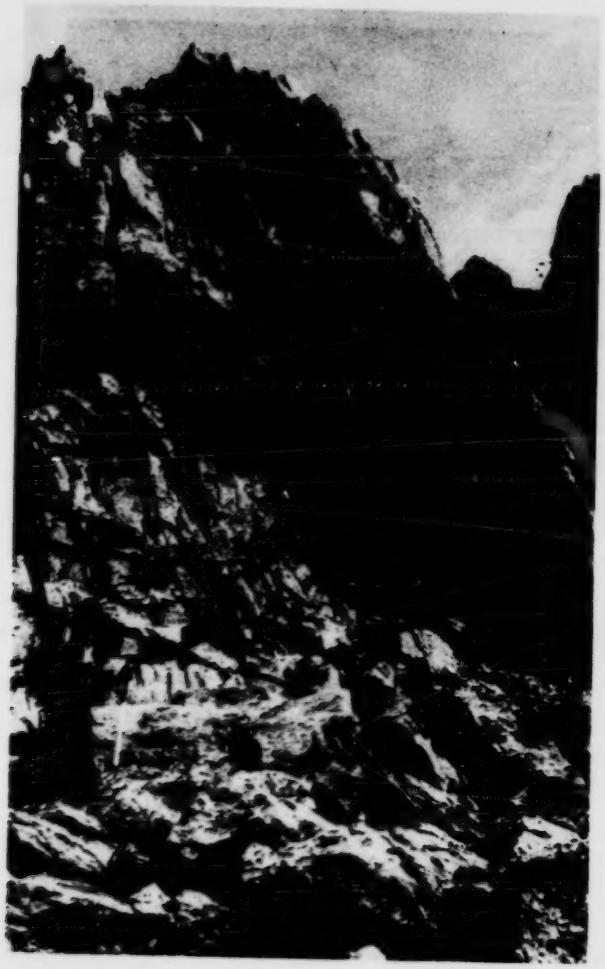


Figure 16. *Cliff exposure (Sec. 25) of thick to massive, light grey dolostones of the Root River Formation, containing abundant molds, possibly of the robust brachiopod* ***Trimerella ohioensis.*** *The top of the cliff is almost reefal in aspect and is 157 m below the top of the Root River Formation (ISPG Photo No. 837-90).*

Late Silurian age of the Root River is in chronostratigraphic continuity with the Early Silurian age of the Mount Kindle Formation in the Franklin Mountains (i.e. the Nahanni Range). In the absence of other data, these considerations indicate that the correlation of the 'Silurian-Devonian unidvided' with the Camsell is far more likely than with the type Root River. The writers have, therefore, adopted this correlation as a working hypothesis.

A third, less likely possiblity, is shown in Figure 19c, where the Delorme passes into coralline dolostone in the lower part of the 'Silurian-Devonian undivided', and the Camsell Formation passes into the upper sandy part. Some unpublished oil company sections show a vuggy, coralline dolostone interval in the lower part of the 'Silurian-Devonian undivided'. However, these sections assign more than twice the thickness of strata to the 'Silurian-Devonian undivided' at Red Rock pass than either the Douglas and Norris (1961) or Brady and Wissner (1961) sections, and no vuggy beds were observed by the writers in this sequence. It is possible that the basal coralline dolostone interval in the unpublished sections is part of the underlying Mount Kindle Formation rather than part of the 'Silurian-Devonian undivided'.

The only age diagnostic fossil found in the Root River Formation is the tentatively identified robust brachiopod *Trimerella ohioensis*, (C-059399, Appendix 2), which is abundant in the Root River Formation of Section 25 (Appendix 1). This brachiopod, which indicates a Niagaran age (i.e. a Wenlock to Early Ludlow age), occurs in eastern Canada, but has not been reported previously from western Canada. Unfortunately, the lack of preservation of the internal parts of this brachiopod, which are preserved as steinkerns, precludes a truly positive identification.

A Late Silurian (Ludlow) age has been assigned to the basal limestone and shale subdivision of the Delorme Formation of Douglas and Norris (1961) at its type section, on the basis of poorly preserved brachiopods of the genus *Conchidium* (identified by B.S. Norford). It should be noted, however, that the genus *Conchidium* also occurs in Wenlock-aged strata in other parts of western North America (Johnson et al., 1976), although some workers (Jackson et al., 1978) regard this brachiopod genus as being most characteristic of Late Silurian (Ludlow-aged) strata. In summary, the age of the Root River Formation may be regarded as occupying all or part of the (Wenlock-Ludlow) time interval, but it is not possible to be more specific.

DEPOSITIONAL AND TECTONIC SUMMARY OF THE MOUNT KINDLE – ROOT RIVER ASSEMBLAGE

The Sunblood Platform, which had been the site of shallow water deposition throughout Middle Ordovician time, began to subside more rapidly in the region of Root Basin in the Root River and Virginia Falls map areas (Fig. 4). The slightly deeper water deposits of the Esbataottine Formation and the lower member of the Whittaker Formation accumulated in this area in late Middle to early Late Ordovician time.

South of this region, a large part of the former Sunblood shelf had subsided to form the Meilleur River Embayment. This large shelfward extension of the Selwyn Basin was the site of uniformly deep water deposition of shales, argillaceous limestones and siltstones from late Middle Ordovician to Middle Devonian time. Root Basin, a northward continuation of the Meilleur River Embayment, was less persistent as a bathymetric feature, but, nonetheless exerted an influence on shelf sedimentation throughout most of this period.

During part of the Middle Ordovician time a part of the shelf region surrounding Root Basin was subaerially exposed and eroded while Root Basin was receiving sediments of the Esbataottine Formation and of the lower member of the Whittaker Formation. A relative rise in sea level inundated this eroded surface, probably by late Middle Ordovician time and certainly by Late Ordovician time, and sandstones of the Little Doctor sandstone and the silty dolostones of the basal part of the Mount Kindle Formation were deposited. Some of these sands may have been shed westward into Root Basin to form the sandy strata of the Whittaker Formation (muOW2) and the solitary sandstone bodies in the Esbataottine Formation. The regional tectonism responsible for the

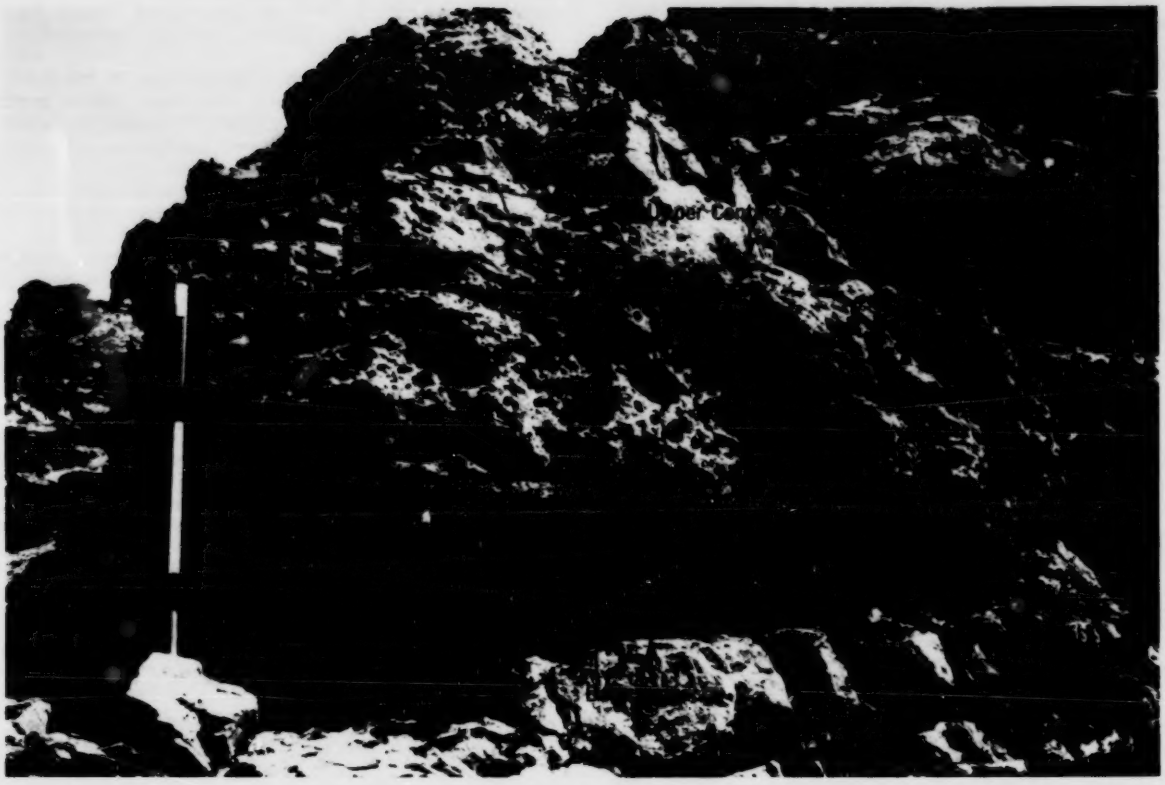


Figure 17. *A stratigraphic mound or pod of dolomitized brachiopod wackestone or boundstone. It is capped by a bed containing fenestral fabric. Abundant molds, possibly of the robust Middle Silurian brachiopod* ***Trimerella ohioensis****, characterize the mound. The base of the mound coincides with the base of the jacob staff, and is 367 m below the top of the Root River Formation in Section 25 (ISPG Photo No. 837-35).*

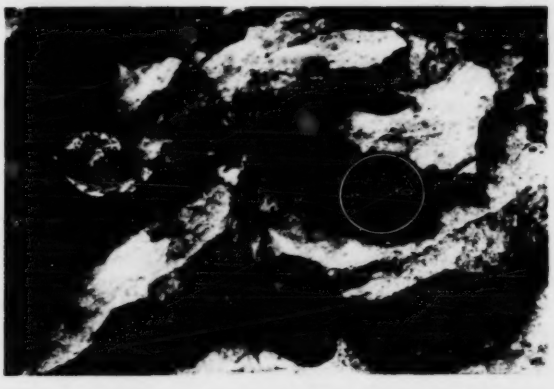


Figure 18. *A mold and a cast of a robust brachiopod (possibly* ***Trimerella ohioensis****) in the dolostone of the Root River Formation in Section 25, 352 m below the top of the Root River Formation (ISPG Photo No. 1420-9).*

development of Root Basin may have also induced Middle Ordovician uplift in the neighbouring shelf and the development of the sub-Mount Kindle unconformity. Alternatively, the development of this unconformity may be linked to the eustatic drop in sea level that is postulated to have occurred at the end of Early Ordovician time (Fig. 20). The Mount Kindle and Whittaker strata overlying the unconformity may then have been deposited during a following rise in sea level which inundated the land surface.

In Late Ordovician and Early Silurian time reefal or biostromal strata of the Mount Kindle Formation, and biostromal strata in Mount Kindle-like rocks that have been mapped as part of the Whittaker Formation, probably formed a shallow water shelf surrounding most of Root Basin. The shallow water biostromes of the Mount Kindle Formation at the shelf edge pass laterally westward across a facies transition to the thin bedded, cherty, basinal dolostones of the upper part of the Whittaker Formation slightly west of the Nahanni Range in the Sibbeston Lake map area. Regionally, the Mount Kindle and reefal rocks, which have, perhaps mistakenly, been mapped as Whittaker strata (Ludvigsen, 1975), form the eastern border of Root Basin. This may be true also for the west side of Root Basin (Ludvigsen, 1975).

In Early and Middle Silurian time argillaceous sediments of the Road River tongue accumulated in Root Basin. Biostromal rocks of the Mount Kindle Formation occupied the shelf regions also from Early Silurian possibly to early Middle Silurian time (Norford and Macqueen, 1975). Probably in Middle Silurian or early Late Silurian time the shallow water dolostones of the Root River Formation were deposited on the shelf around Root Basin, and began to prograde in toward the basin centre over Road River shales so that the area of

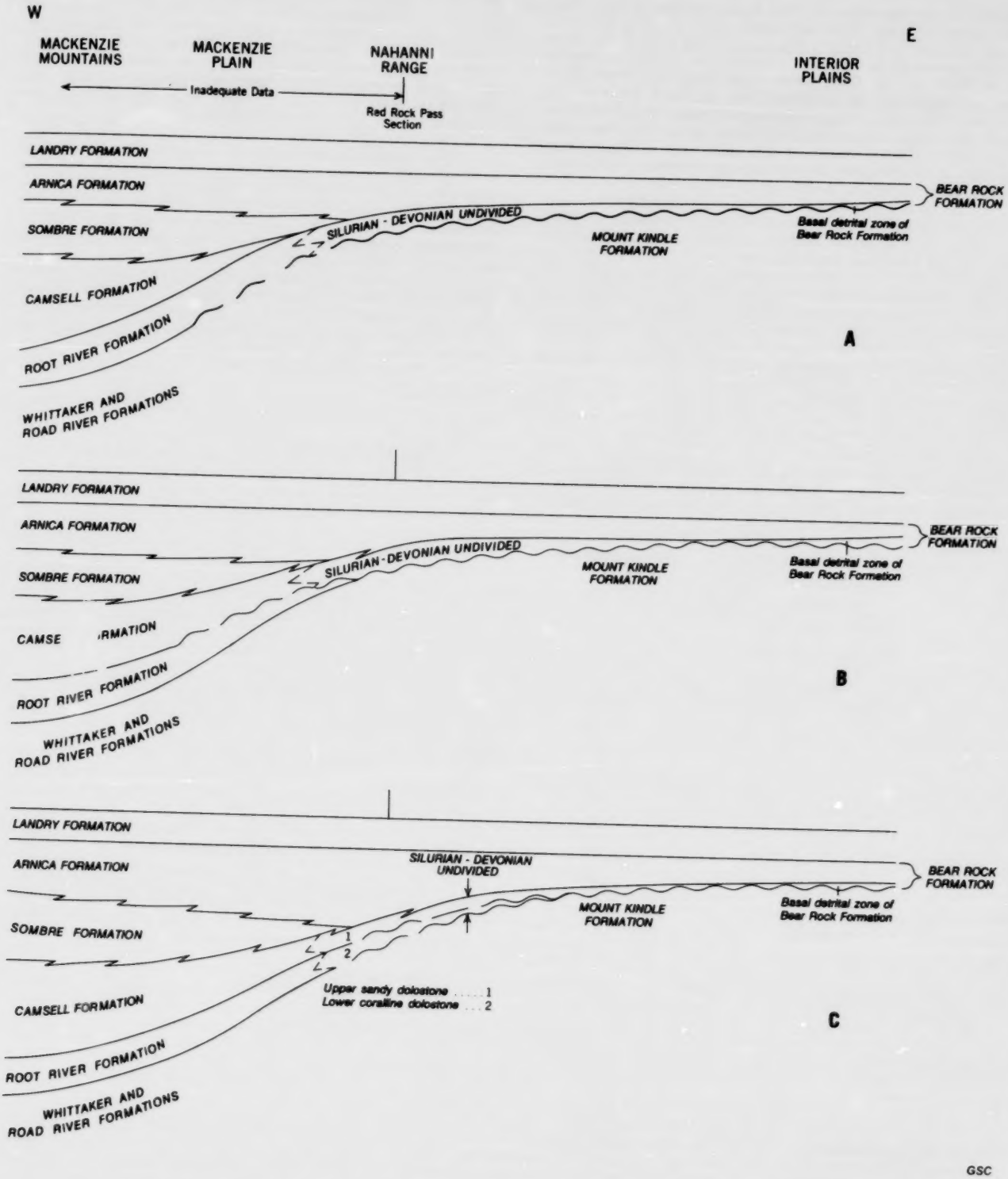


Figure 19. *A series of schematic alternative correlations of formations within the Silurian to Middle Devonian sequence between the Mackenzie Mountains, the Nahanni Range and farther east to the Interior Plains around Fort Simpson. Unfortunately, the transition between the thick (~2500 m) multiformational sequence in the Mackenzie Mountains and the much thinner (~1000 m) and less varied sequence in the Nahanni Range occurs in the subsurface of the Mackenzie Plain.*

deeper water deposition in Root Basin was diminished. This concept of a Root River carbonate shelf fringing the Root Basin is based on three Root River occurrences: the Root River exposed at its type section along the northern border of Root Basin in the Root River map area; the Root River outcrop bordering the southeast part of Root Basin in the Virginia Falls map area; and, an occurrence of the Root River Formation in the Thundercloud Range of the Glacier Lake map area (NTS 95L) defining the west side of Root Basin. Discussion of this last occurrence is deferred to a later report.

Deposition of the Root River Formation probably coincided with rising sea level, culminating in the Middle Silurian sea level highstand (Fig. 20) that has been inferred by many workers (Vail, 1977). In general, a rise in sea level favours the development of carbonate-dominated shelves such as the Root River shelf in areas of previous terrigenous deposition, because the source of terrigenous material moves inland a greater distance away for the depositional site. The antipathetic relationship of terrigenous and carbonate deposition and the rapidity of carbonate deposition in the absence of terrigenous material have been well documented (Wilson, 1975). Using an average rate of 1 m/1000 yrs. for Holocene shelf carbonate deposition (Wilson, 1975), the entire Root River Formation could have been deposited in less than 0.5 million years, a short time span compared with the millions of years available for Root River deposition in the Middle and early Late Silurian time span.

The faunal control available suggests that the end of deposition of the Root River carbonates coincided with the beginning of deposition of the orange siltstone facies of the Cadillac Formation in early Late Silurian time. The terrigenous silts and sands represented by the basal beds of the orange siltstone facies may be the products of subaerial erosion attendant on the profound Late Silurian drop in sea level that has been postulated by Vail (1977) and many earlier worker (Fig. 20). The beginning of deposition of the Cadillac Formation marks the transition from sedimentation in the Root River-Mount Kindle assemblage to sedimentation in the succeeding Prairie Creek assemblage.

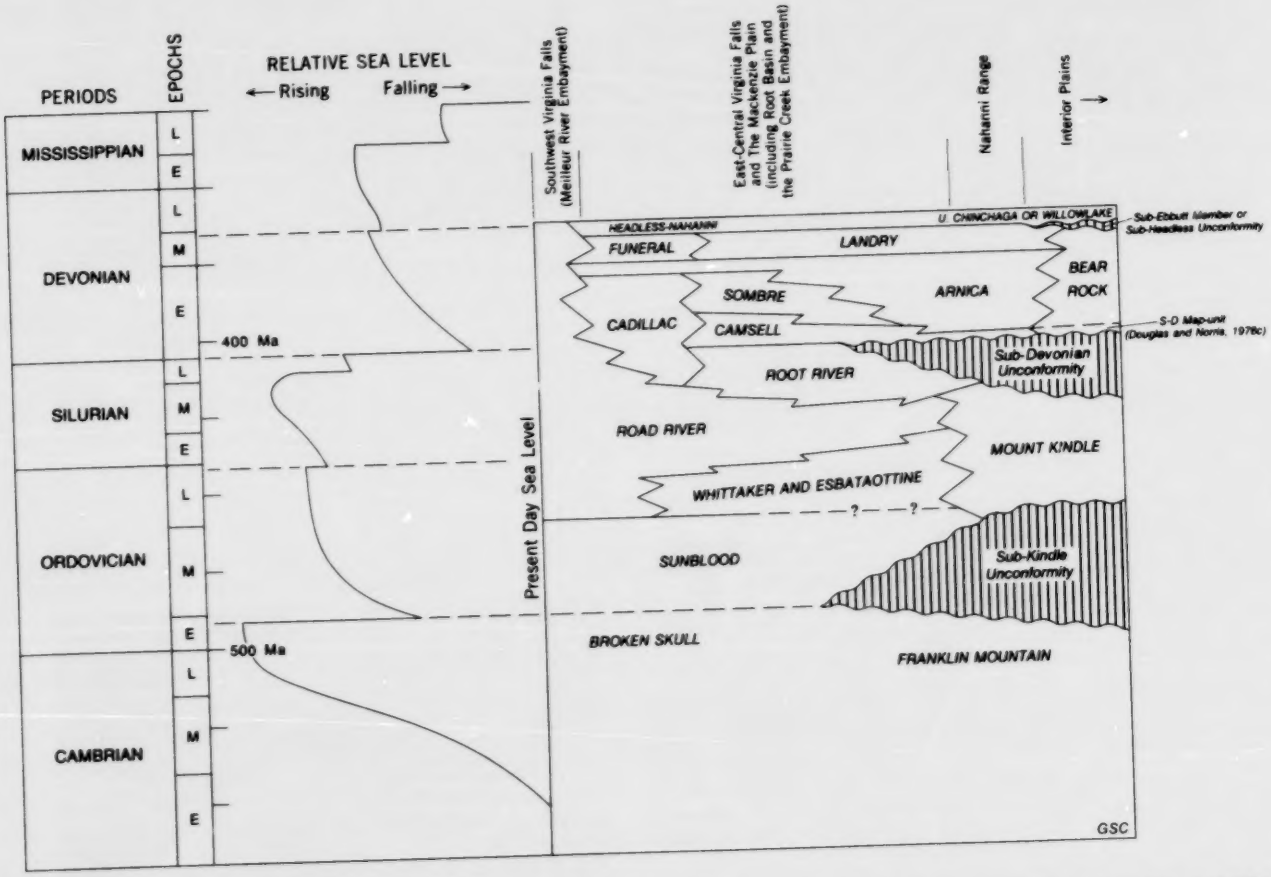


Figure 20. *A schematic chronostratigraphic chart of early Paleozoic formations along an east-west line of section extending from the Interior Plains westward to the southwest part of the Virginia Falls map area. Also shown is a plot of early Paleozoic sea level relative to present day sea level, according to Vail et al. (1977). Large unconformities, such as the sub-Mt. Kindle and sub-Devonian unconformities, may coincide with the large drops in sea level that have been inferred to occur in Early Ordovician and Late Silurian times. The Prairie Creek assemblage was deposited during the Late Silurian sea level drop and during the ensuing Early to Middle Devonian sea level rise.*

CHAPTER III

THE PRAIRIE CREEK ASSEMBLAGE

Introduction

The discussion of the Prairie Creek assemblage and its component formations forms the major part of this report. As previously mentioned, this assemblage records the initiation and subsequent history of the Prairie Creek Embayment, a paleogeographic feature contained entirely within the Virginia Falls map area. This small embayment, which opened southwestward into the larger Meilleur River Embayment of the Selwyn Basin, was an unfilled southern remnant of Root Basin, which was a significant bathymetric feature during deposition of the underlying Mount Kindle-Root River assemblage.

This assemblage has been divided into two phases; the Lower Cadillac phase and the Upper Cadillac phase. The Lower Cadillac phase is composed of the orange siltstone and megabreccia members of the Cadillac Formation within Root Basin, and later within the Prairie Creek Embayment. The Vera Formation and the Corridor Member of the Camsell Formation were deposited outside the embayment (Fig. 11). The Upper Cadillac phase is represented by; the pink shale member that forms the upper part of the Cadillac Formation, the basinal member of the Arnica Formation, the detrital member of the Sombre Formation within the embayment area, and the Sombre and Arnica formations outside the embayment (Fig. 11).

Many of these formations and members are new and their extent beyond the Virginia Falls map area is not completely known. Recent field work indicates that the Vera Formation is widespread beneath the Camsell Formation throughout the Southern Mackenzie Mountains within the area covered by Root Basin (Fig. 4). Also, the orange siltstone member of the Cadillac Formation has been mapped as a major part of the Delorme Formation in the Root River map area (Douglas and Norris, 1976c), north of the Virginia Falls map area, throughout the region of Root Basin. On the other hand, the pink shale member of the Cadillac Formation, the detrital member of the Sombre Formation and the basinal member of the Arnica Formation occur only in the Virginia Falls map area and appear to be related solely to the Prairie Creek Embayment.

The combined orange siltstone and megabreccia members of the Cadillac Formation form an eastward-thickening sediment wedge that overlaps the Root River shelf edge (Fig. 11). Westward, the lower part of the orange siltstone member passes into the Road River Formation, whereas the upper part passes northward and westward into the Vera Formation (Fig. 11). A partial outline of the Prairie Creek Embayment and the Sombre Salient on the west side of the embayment are first apparent with the advent of the Vera Formation (Fig. 21). The lower Cadillac phase culminated with the spread of shallow water sediments of the Camsell Formation and part of the Sombre Formation forming a shallow water shelf around the embayment (Fig. 22).

Clean carbonate sediments of the thick Sombre and Arnica formations surrounded the embayment during deposition of the Upper Cadillac phase. The detrital member of the Sombre Formation, the basinal member of the Arnica Formation and the pink shale member of the Cadillac Formation, which collectively filled the embayment during deposition of this phase, have a combined thickness that is greatest near the edge of the embayment and least near its centre (Fig. 23).

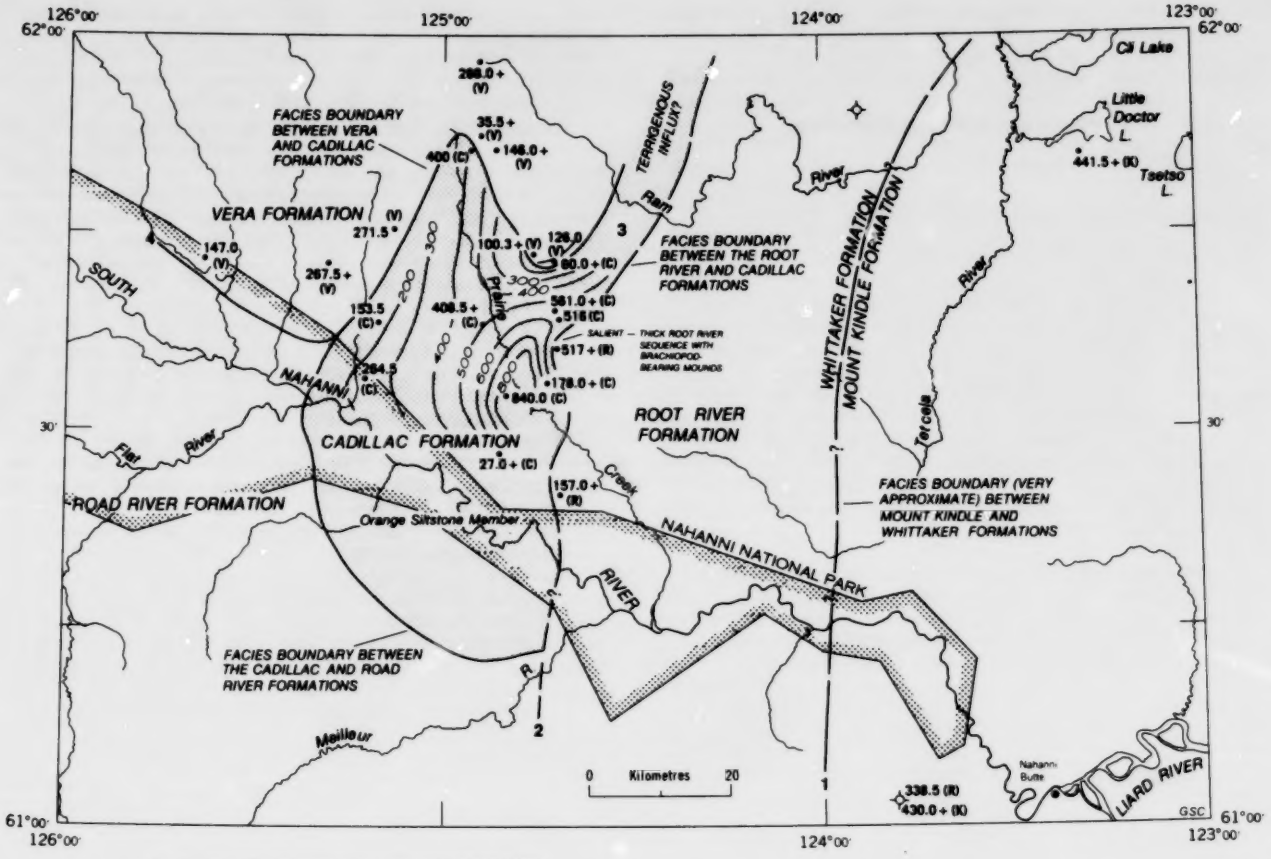
The availability of stratigraphic information concerning the Prairie Creek assemblage is somewhat limited. Strata that are transitional between the shelf deposits and the embayment fill are overridden and buried by the Tundra Thrust on the east side of the embayment and by the Manetoe and Arnica thrusts on the west side (Fig. 81, in pocket). The convergence of eastward- and westward-directed thrusts at the north end of the embayment makes it difficult to define the northern limit of the embayment and also to find complete stratigraphic sections around the north end of the embayment. Another major limitation is the lack of stratigraphic information concerning the transition between units filling the embayment and the mass of argillaceous Road River sediments in the southwest corner of the Virginia Falls map area, a region of low relief and thick vegetation cover. In spite of these limitations, however, the Prairie Creek Embayment is well defined by available facies data.

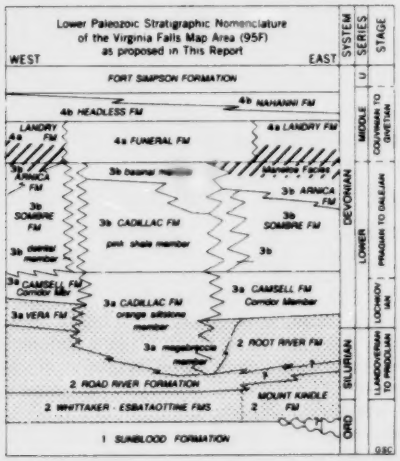
THE LOWER CADILLAC PHASE OF THE PRAIRIE CREEK ASSEMBLAGE

Cadillac Formation (new name)

Introduction

The Cadillac Formation (SDc), a formation defined here for the first time, is widespread throughout the Virginia Falls map area (Fig. 81, in pocket). It is a sequence dominated by slightly to very recessive bright orange- to brown-weathering, thin bedded, dolomitic siltstones and sandstones with scattered limestone beds in its lower part and by pink dolomitic siltstone and shale in its upper part. The formation is named after Cadillac Creek, a tributary of Prairie Creek immediately south of the type section, Section 11 (figs. 3, 13), the base of which is at 61°33'N latitude and 124°47'W longitude (Appendix 1). This section extends westward along a ridge parallel to Cadillac Creek and it begins in the Whittaker Formation exposed at creek level next to Prairie Creek (Appendix 1). An incomplete section of the Cadillac Formation in Section 10, farther north at 61°37'N latitude and 124°53'W longitude, yielded more faunal elements (Appendix 2), but the uppermost part of the Cadillac Formation is absent and the section ends at a fault contact.



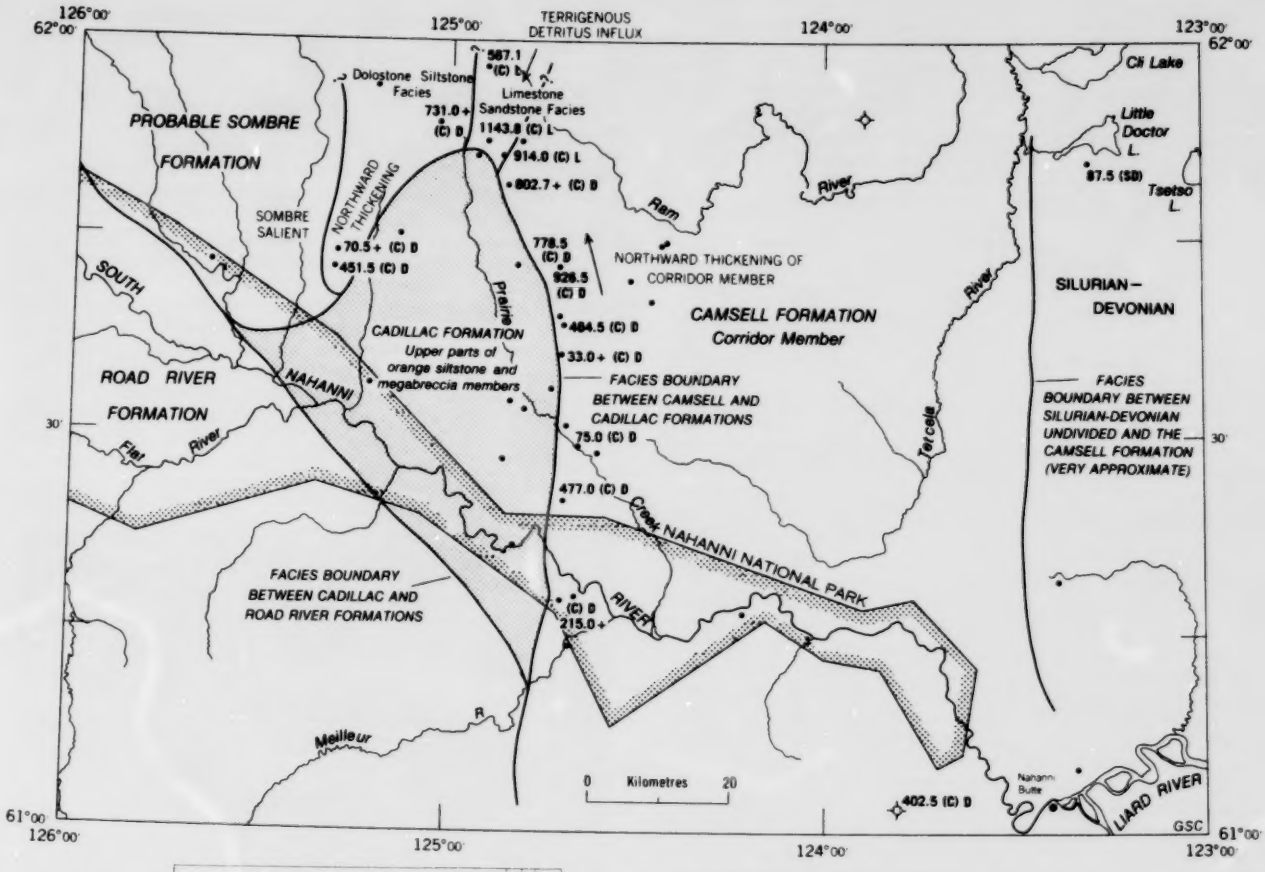


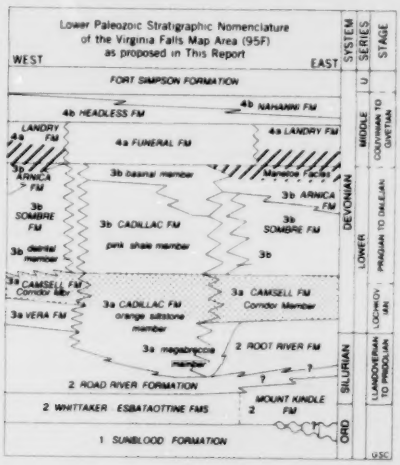
ROOT RIVER FORMATION ..... (R)
CADILLAC FORMATION Orange Siltstone Member ..... (C)
VERA FORMATION ..... (V)
MOUNT KINDLE FORMATION ..... (K)

Thickness in metres 338.5

Depositional edge of formations .....

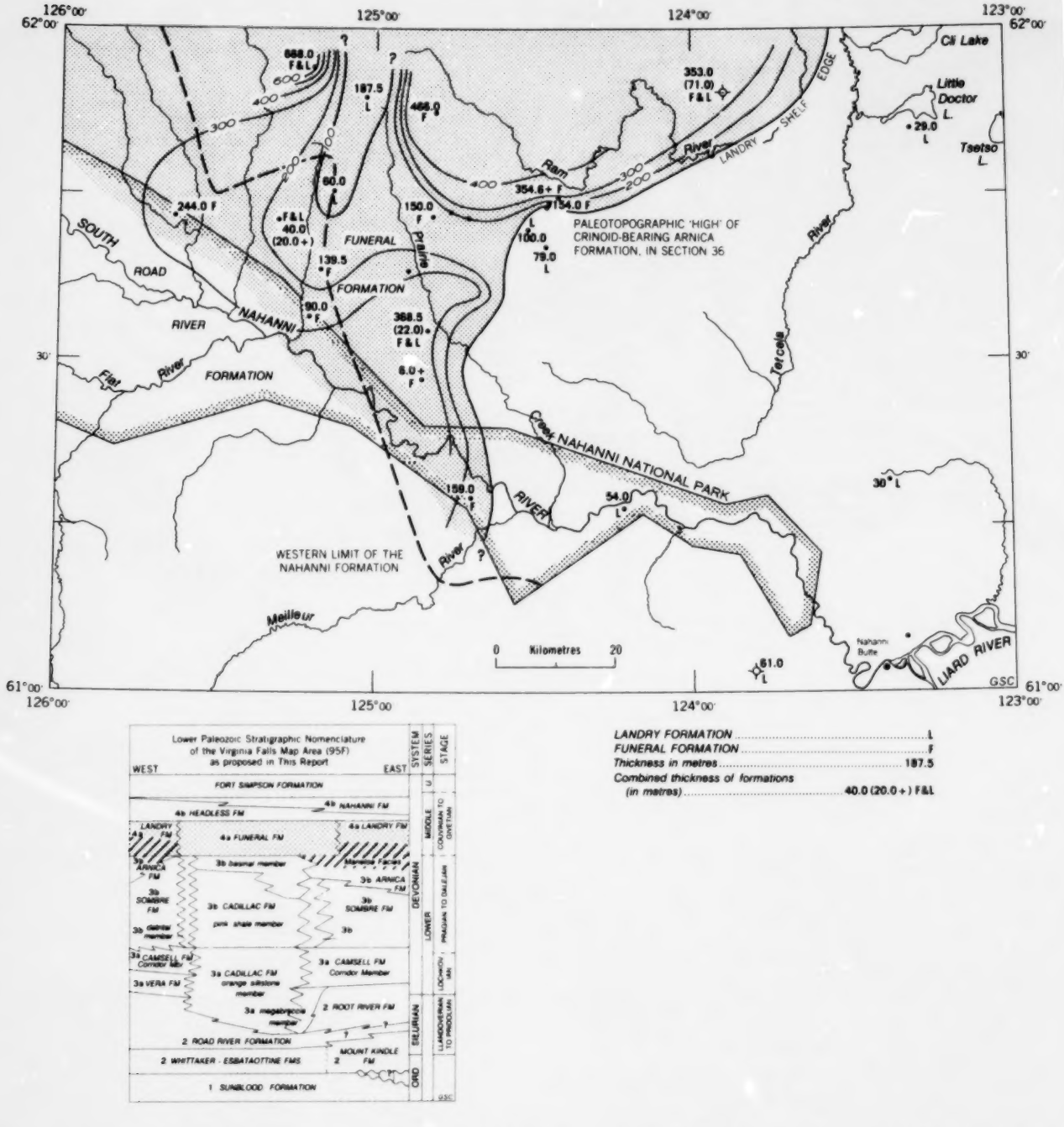
Figure 21. *A combined paleogeographic and isopach map of the Mount Kindle-Root River assemblage and part of the lower Cadillac phase of the Prairie Creek assemblage, involving the units shaded in the schematic stratigraphic cross-section (inset). The depositional edges of the Mount Kindle (1), Root River (2), and Vera (4) formations, and the thickness of the orange siltstone member of the Cadillac Formation (3) are shown. Orange silts and sands of the Cadillac Formation may have moved southwestward into the Prairie Creek region along a path following the shelf edge of the Root River carbonates. Deposition of the Vera Formation, throughout the Root Basin and southward to its depositional limit in the Virginia Falls map area, heralds the development of the Prairie Creek Embayment in Early Devonian time.*





Camsell Formation (Dolostone-Siltstone Facies, Limestone-Sandstone Facies) ..... (C) D (C) L
Silurian-Devonian undivided ..... (SD)
Thickness of dolostone-siltstone facies (in metres) 464.5

Figure 22. *An interpretive paleogeographic map showing the shelf edge of the Corridor Member of the Camsell Formation (shaded in inset). Silt and sand may have continued to move southward into the embayment across the region of the limestone-sandstone facies. Note the absence of the Corridor Member on the west side of Sombre Salient.*



LANDRY FORMATION L
FUNERAL FORMATION ..... F
Thickness in metres 187.5
Combined thickness of formations (in metres) ..... 40.0 (20.0+) F&L

Figure 23. *A combined paleogeographic and isopach map of the Upper Cadillac phase (shaded in inset) of the Prairie Creek assemblage showing the shelf edge of the combined Sombre and Arnica formations. The combined thickness in metres of the Sombre and Arnica formations is shown on the shelf area around the embayment and the combined thickness of the pink shale member of the Cadillac Formation, the detrital member of the Sombre Formation, and the basinal member of the Arnica Formation is shown within the embayment.*

Lithology, sedimentary structures, distribution and thickness

The Cadillac Formation is readily divisible into three distinct lithofacies or members: an orange siltstone member (SDc), a megabreccia member (SDcm), and a pink shale member (SDc). The orange siltstone member and the laterally equivalent megabreccia member form the lower part of the Cadillac Formation, the pink shale member the upper part. The orange siltstone and pink shale members occur throughout Root Basin and the Prairie Creek Embayment, but the megabreccia member appears to be confined to a relatively narrow belt adjacent to, and parallel with, the shelf edge of the Root River Formation, and is overlain by the Camsell Formation in the Virginia Falls map area (Fig. 11). The megabreccia member is really an eastward extension of the orange siltstone member underneath the Camsell Formation on the east side of the embayment.

Figure 24. *Bright orange weathering, thin bedded, laminated, fine grained sandstone with occasional small ripple structures in the orange siltstone member of the Cadillac Formation. 360 m above the base of the Cadillac in Section 10 (ISPG Photo No. 837-79).*

Orange siltstone member

The bright orange weathering, thin bedded, dolomite-cemented, argillaceous, impure quartzarenite siltstones and sandstones of the orange siltstone member are commonly thinly laminated, platy and contain straight-crested, low-amplitude, isolated, or starved, ripples (figs. 24, 25). Individual laminae or very thin beds tend to be graded with fine grained, rounded quartz grains grading upward to quartz silt. Some beds have slightly scoured and load-casted bases (Unit 18, Sec. 11). Individual grains are coated with limonite, including some detrital dolomite silt- and fine sand-sized grains. Thicker beds, up to 50 cm thick, tend to be sandy dolostone rather than dolomitic sandstone. X-ray analyses of representative samples are shown in Table 2.

Short vertical burrows, like those shown in Figure 26, are present in some beds, but are uncommon. Thin, lenticular beds of white, dolomite-cemented, fine grained quartzarenite sandstone occur in a few places. No large scale, current related sedimentary structures, such as tabular or trough crossbeds, were observed in the terrigenous sediments of the orange siltstone member.

Turbidite deposits of conglomeratic carbonate debris are scattered throughout this facies (Fig. 13) and were observed to range in thickness from 5 cm to nearly 1 m. Their lateral continuity could not be determined absolutely because of incomplete exposure, but some extended 15 m laterally with constant thickness. Thinner flows exhibit wavy bed contacts and are mainly crinoid packstones and wackestones (Fig. 27). Many display crude normal grading with fragments oriented parallel to bedding. This poor grading reflects the small size range of crinoid ossicles in these beds. Thicker debris flows contain a variety of types of fragments that are normally graded. Crinoid, coral (e.g. *Coenites*) and brachiopod fragments are abundant in these flows, but equally abundant are subangular to subrounded lime wackestone and mudstone lithoclasts, which are up to 10 cm long (Fig. 28). Debris flows, or turbidites, that have tranversed and come to rest on orange siltstone commonly contain a large proportion of yellow silt and argillaceous matrix material (Fig. 27). Beds underlying these flows are slightly deformed (Fig. 27) possibly because of shear stresses exerted by debris flows during their passage over these beds. Small slump folds also occur within beds. In summary, evidence pointing towards a subaqueous mass flow origin as turbidites for these detrital carbonates may be summarized as follows:

Figure 25. *Current rippled, dolomite-cemented, fine grained sandstone in a sample from the megabreccia member of the Cadillac Formation, 85 m above the base of the formation in Section 24. Ripple marks and laminations are outlined by dark clay (ISPG Photo No. 1445-26).*

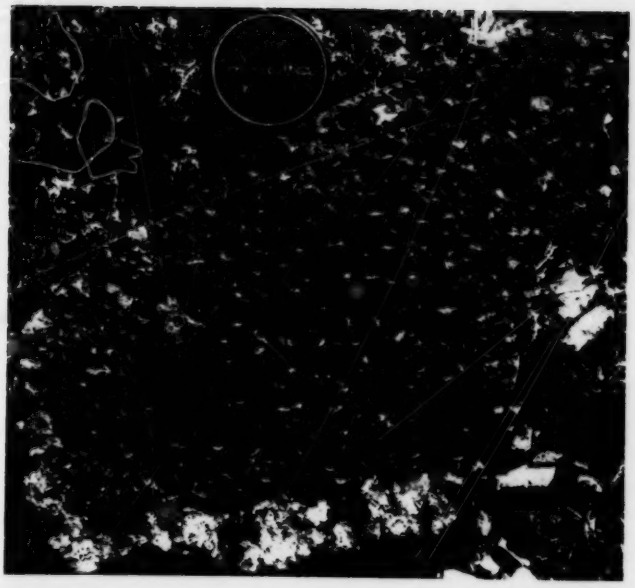


Figure 26. *Bedding surface of a burrowed bed of brown, fine grained sandstone in the megabreccia member of the Cadillac Formation. 79.5 m above the base of the Cadillac Formation in Section 24 (ISPG Photo No. 837-77).*

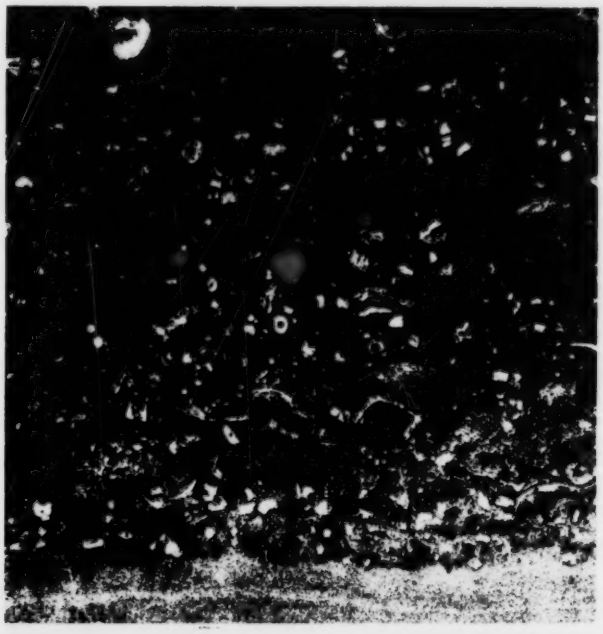


Figure 28. *A polished sample from the turbidite bed shown in Figure 27. The light coloured material in the matrix is orange and yellow, argillaceous material derived from the underlying bed (ISPG Photo No. 1451-3).*

Figure 27. *A graded oligomictic carbonate turbidite deposit in the orange siltstone member of the Cadillac Formation. Relatively coarse fragments of finger corals, brachiopods and crinoids near the base of the flow grade upward to fine grained lime sand and silt. The matrix of the turbidite is orange-yellow argillaceous material that may have been scraped up from the substrate by the flow. 751.5 m above the base of the Cadillac Formation in Section 11 (ISPG Photo No. 1602-4).*

Figure 29. *An exposure of yellowish orange, silty and argillaceous lime mudstone in the Cadillac Formation. Thicker beds contain crinoid ossicles. Note the load cast at the base of the prominent bed in the upper part of the outcrop. 26 m above the base of Section 26 in the megabreccia member of the Cadillac Formation (ISPG Photo No. 1837-99).*

1) Pronounced normal grading within beds.

2) Deformation of underlying beds by drag folding and rapid loading (flame structures).

3) Incorporation of material from underlying beds into matrix of resedimented carbonate beds.

4) Slump folds indicating a depositional slope.

Small lenticular bioherms or mud mounds containing abundant, partly silicified corals and stromatoporoids are scattered throughout the upper part of the orange siltstone member as, for example, in the type section (Fig. 13; Appendix 1). These bioherms are commonly less than 2 m thick and less than 10 m broad and contain abundant crinoids with subsidiary brachiopods and corals (e.g. *Coenites*).

Megabreccia member

The megabreccia member, the eastward facies equivalent of the orange siltstone member, is similar to the latter in many respects. The bulk of the megabreccia member is composed of laminated, thin bedded, orange siltstone and fine sandstone like the orange siltstone member (Fig. 24). Some sandstone beds contain short vertical burrows (Fig. 26) and starved ripples are common, as in the orange siltstone member. Thin- to medium-bedded resistant beds of dolomitic crinoidal wackestone are interspersed throughout the megabreccia member with some beds displaying load-casted bases (Fig. 29). Some slump folds involving a metre of strata were observed in this member.

In addition to attributes in common with the orange siltstone member, the megabreccia member contains thick, oligomictic, carbonate breccia bodies that are distinctly different from the mass flow deposits in the orange siltstone member. The roughly lenticular breccia bodies were observed to range in thickness from several metres to more than 10 m and are up to 100 m in greatest width. The largest exposure of these breccias occurs on the west side of the south end of Tundra Ridge, immediately south of Section 22 (figs. 30, 31). This exposure, which is near the transition between the Vera and Cadillac formations, shows crinoid wackestone mounds on the left (or north) side of the exposure, passing laterally to brecciated mounds on the right (or south) end. South of this exposure all of these mounds are brecciated. They are coarsely fragmental, with some observed blocks more than 1 m across, and display a chaotic internal fabric. Undolomitized breccia bodies are visibly crinoidal, with crinoids abundant in the lime wackestone matrix and in the blocks. The low colour contrast between fragments and matrix, particularly in dolomitized breccia bodies, causes difficulty in discerning the complete outlines of fragments (Fig. 32).

In some places some of the underlying sediments have been reworked and incorporated into distinct basal zones in the large breccia bodies. Also, the lower parts of some breccia bodies contain angular, platy clasts of dark orange-grey, silty dolostone, indicating that the substrata had lithified prior to being incorporated into the basal part of the breccia (Fig. 32). Other breccia bodies have basal zones that are contaminated uniformly with orange silt and sand from the underlying substrate that could not have been lithified before reworking. Substrate sediments beneath some of these breccia bodies have undergone visible soft sediment deformation where large angular blocks protrude from the bases of the breccia into the underlying sediments (Fig. 33).

Pink shale member

The pink shale member, which overlies the orange siltstone member (Fig. 2) throughout the embayment, and is stratigraphically above the megabreccia member, is not part of the Lower Cadillac phase of the Prairie Creek assemblage, but is discussed here as part of the Cadillac Formation. Recessive, pink weathering, very thin bedded to laminated, silty dolostone and dolomitic siltstone form most of this facies. Limonite-coated detrital dolomite grains, with an admixture of quartz silt, form the clastic component of this lithology and dolomite forms the interparticle cement.

Thick beds of medium to dark grey resedimented limestone and dolostone are scattered throughout this sequence (figs. 13, 34). These thick beds commonly are composed of a number of thin, very planar beds of intraclast wackestone that commonly exhibit normal grading and faint lamination. Some intraclasts are crinoid fragments but most are fragments of pelletal lime mudstone (Fig. 35). Commonly, these planar beds have slightly erosional lower contacts and some have incorporated pink material from underlying beds (Fig. 35). In general, these thin to medium, weakly graded beds of intraclastic and crinoidal lime wackestone are separated by thicker intervals of pink, calcareous or dolomitic, laminated siltstone and silty lime mudstone with shaly partings (Fig. 34). Detrital quartz forms most of the terrigenous component (e.g. sample 22 in Table 2).

The resedimented beds probably represent turbidite-like sediment gravity flow deposits. A simple explanation for their origin is that they are the downdip, or basinward continuation of the coarser grained lime packstone and wackestone turbidite beds in the correlative detrital member of the Sombre Formation near the shelf edge of the embayment. Similar downdip gradations to finer grain sizes in carbonate turbidite deposits have been recorded in other Paleozoic slope-deposited sequences in Europe (Meischner, 1964) and the Arctic Islands (Davies, 1977). Some soft sediment slump folds were observed, indicating a depositional slope (Fig. 13).

Although the pink shale member is readily identifiable in stratigraphic studies it is not an easily recognized marker for mapping purposes. The lower contact is largely obscured by vegetation and, at a distance, the pink colouration is prominently visible only in the upper few metres. Consequently, it has not been carried as a map unit (Fig. 81, in pocket).

Thickness data

The combined thickness of the orange siltstone member and the coeval megabreccia member is greatest on the east side of the embayment. A maximum thickness of 840 m at the type section decreases westward and northward to less than 200 m on the west side of the embayment (Fig. 21). The younger, overlying, pink shale member is commonly between 100 and 200 m thick throughout most of the embayment. The anomalous thickness of 437 m for this member in Section 5 may indicate that the pink shale member is thickest immediately adjacent to the detrital member of the Sombre Formation (Fig. 23).

Figure 30. *An eastward view of the hanging wall of the Tundra Thrust at the south end of Tundra Ridge. The ridge crest extending eastward in the background is the line of section for Section 22. The exposed cliff face in the foreground is about one kilometre long and the Tundra Thrust is located at its foot. Mounds of light grey crinoid wackestone occur along a definite horizon in the orange-yellow siltstones of the megabreccia member. These mounds appear to be brecciated toward the south end (i.e. toward the right). Symbols as on Figure 81 (legend) (ISPG Photo No. 1420-11).*

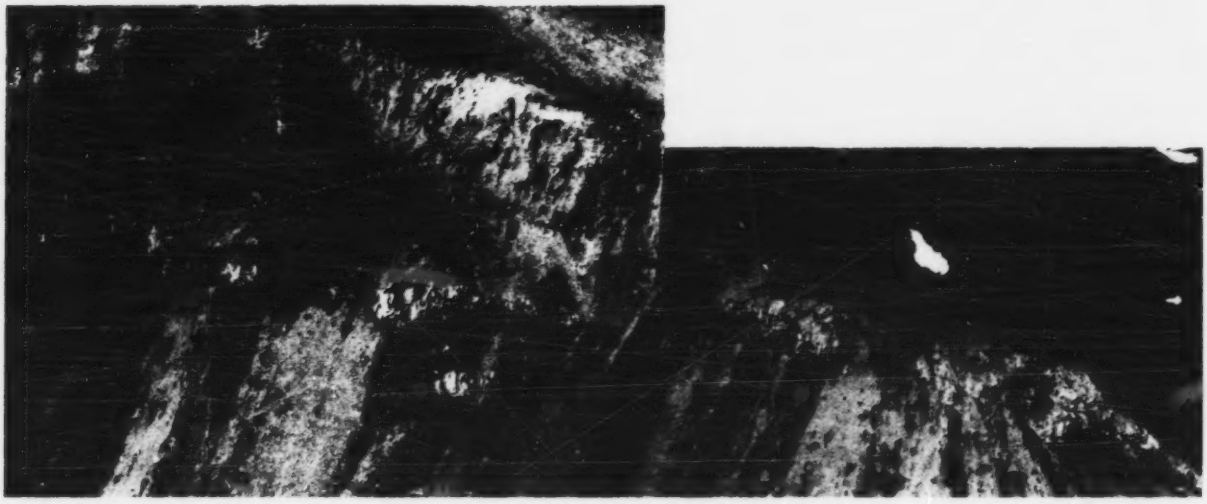


Figure 31. *A closer view of the crinoid wackestone mounds shown in Figure 30. These mounds, which are 48 m below the top of the megabreccia member of the Cadillac Formation in the nearby South Tundra 1 Section (Sec. 22), are earliest Early Devonian or Lochkovian in age (ISPG Photo No. 837-27 and 28).*

Figure 32. *A massive, light grey, crinoidal dolostone breccia body overlying dark, orange-grey, thin bedded dolostone laminite. Abundant tabular clasts of the underlying dark dolostone have been reworked into the lower part of the breccia body. Crinoid mud mounds (e.g. Fig. 30), brecciated during mass movement down submarine slopes, may have been the ancestors of these breccia bodies. This exposure is in the megabreccia member, 186 m above the base of the Cadillac Formation in Section 24 (ISPG Photo No. 1420-7).*

Contact relationships, age and correlation

The Cadillac Formation overlies the Road River Formation with a conformable, gradational contact that is chosen where the yellowish grey, argillaceous limestones of the Road River Formation become noticeably orange weathering and silty (Fig. 13). The basinal member of the Arnica Formation overlies the Cadillac Formation with an abrupt but conformable contact (Fig. 13).

Within the Cadillac Formation the Late Silurian to early Early Devonian orange siltstone and megabreccia members pass laterally westward into the Road River, Vera and Camsell formations and part of the Sombre Formation (Fig. 11). The bulk of the orange siltstone and the megabreccia members may pass eastward into a relatively thin sequence at the top of the Root River Formation and possibly some basal Camsell beds (Fig. 11). The middle Early to late Early Devonian pink shale member, overlying the orange siltstone member, appears to be coeval with the Sombre Formation around the embayment (Fig. 11; Appendix 2). The detrital member of the Sombre Formation forms a narrow facies belt that separates the shelf Sombre from the pink shale member of the Cadillac Formation in the central part of the embayment.

The northward correlation of the orange siltstone member is uncertain because few sections in the critical area were examined, partly because the northward convergence of thrust faults at the north end of the embayment makes it difficult to find complete sections. Recent field work indicates, however, that the orange weathering strata on the east flank of the Whittaker Anticline, previously assigned to the Delorme Formation by Douglas and Norris (1961), probably represent the northward continuation of the Cadillac Formation into the Root River map area (Fig. 7). The upper part of the orange siltstone member probably passes northward into the Vera Formation which itself continues northward into the Root River map area (Fig. 7).

Diagnostic faunas in the members of the Cadillac Formation include monograptid graptolites, conodonts, and trilobites (Appendix 2). A reference section for the Cadillac Formation, Section 10, is particularly fossiliferous.

The age of the Cadillac Formation ranges at least from Late Silurian (Ludlow) to middle Early Devonian (Zlichovian). The lower part of the Cadillac, including the orange siltstone and megabreccia members, contains fewer identifiable faunal elements than does the upper part and hence is less

well dated. The occurrence of late Early Silurian (Llandovery) graptolites near the top of the Road River tongue at Section 10 may indicate that some of the undated strata of the Cadillac, beneath the beds dated as Late Silurian (Ludlow) in Section 10 (GSC loc. C-059275; Appendix. 2), are Wenlock or late Early Silurian in age. Faunas near the top of the lower part of the Cadillac Formation indicate an earliest Early Devonian age (Lochkovian; Fig. 10).

In the pink shale member of the upper part of the Cadillac Formation crinoids form almost the entire macrofauna with a small admixture of coral and brachiopod fragments. Conodonts, such as *Pandorinellina exigua philipi*, *Icriodus* cf. *I. steinachensis*, and *Eognathodus sulcatus kindlei* among others in the pink shale member, indicate an age range from the Lochkovian-Pragian boundary to the Zlichovian stage of the Early Devonian (Appendix 2). The pink shale member probably may be correlated with part of the detrital member of the Sombre Formation, which is also dated as Pragian to Zlichovian.

Figure 33. *A large block at the base of a limestone breccia body. The block has indented the underlying thin bedded, orange-grey, laminated, argillaceous lime mudstones. 108 m above the base of Section 26 in the megabreccia member of the Cadillac Formation (ISPG Photo No. 837-96).*

Vera Formation (new name)

Introduction

The Vera Formation (IDV), defined here for the first time, is widespread throughout the Virginia Falls map area. It is primarily a rather recessive sequence of yellow, orange or pink weathering, argillaceous limestone that is exposed in the northwest part of the Virginia Falls map area (Fig. 81, in pocket) and is named after Vera Creek which flows southward between the Arnica and Manetoe ranges into the South Nahanni River (Fig. 3). The type section of the Vera Formation is part of Section 7, which begins at 51°46'N latitude and 125°06'W longitude (Appendix 1). This is one of the few places in the Virginia Falls map area where the lower contact is exposed.

Rocks mapped as Vera Formation were previously included in several different units. In the area around the type section along the Manetoe Range and west of Manetoe Range the Vera Formation had been mapped previously as part of the OSD map unit of Douglas and Norris (1976a), whereas the Vera Formation, exposed along Tundra Ridge and in the Root River map area, had been mapped previously as part of the Delorme Formation (Douglas and Norris, 1976a, 1976c). Norris and Uyeno (1981) tentatively applied the name 'Delorme' Formation to strata at Cathedral Mountain (Sec. 1) that are regarded here as belonging to the Vera Formation.

Lithology, sedimentary structures, distribution and thickness

The main lithologic component of the Vera Formation, the yellow, pink, and orange weathering argillaceous limestone facies, is composed of very thin bedded couplets of dull to bright yellow-green, pink or orange, argillaceous lime mudstone, alternating with thin, wavy to nodular and slightly crinoidal, dark to medium grey lime mudstone, giving the rock a distinctive striped appearance in outcrop. Some beds have undergone sedimentary boudinage to produce a nodular fabric (Fig. 36) similar to other nodular, argillaceous limestones described by Tucker (1973 - Devonian of Germany) and Cook and Taylor (1977 - Whipple Cave limestone in Cambrian of Nevada) that are considered to occupy an upper slope position below wave base but in the photic zone. Brachiopods are common, particularly toward the top of the Vera Formation. The Vera Formation at its type section (Fig. 12) is perhaps slightly more silty than most of the strata we have mapped elsewhere as Vera Formation.

Rocks of the Vera Formation are well exposed in the Virginia Falls map area along the south end of the Arnica Range (Sec. 3), at Cathedral Mountain (Sec. 1), and along the northern part of Tundra Ridge (Sec. 18). The southern extension of the Vera Formation along Tundra Ridge (secs. 21, 22) is also slightly atypical in that the pastel coloured lime mudstones have been dolomitized, but they are readily recognizable as being the dolomitized equivalent of the Vera Formation limestones. In the Root River map area the Vera Formation was part of the Delorme Formation of Douglas and Norris (1976c) in the Whittaker and Delorme ranges (secs. 45, 46).

In addition to the rhythmically bedded, brightly coloured, argillaceous limestone couplets, coral- and crinoid-bearing mounds (bioherms?) are scattered throughout the upper part of the Vera Formation on the west side of the embayment, such as in sections 1 and 3 (Fig. 12). These mounds range in size from less than 1 m thick and a few metres wide to tens of metres thick and hundreds of metres wide, and occur within pink and yellow weathering, silty and argillaceous, very thin bedded lime mudstone and wackestone that is similar to the underlying rhythmically bedded, argillaceous limestone. These small bioherms form a noticeable but minor part of the Vera Formation on the west side of the embayment but are not represented on the east side.

Figure 34. *This is a view of the upper part of the pink shale member of the Cadillac Formation and the lower part of the Sombre detrital member, in Section 6 (units 9 and 10). Pink, platy, argillaceous lime mudstones of the pink shale member in the foreground contain abundant, solitary, medium to thick beds of lime wackestone. Medium beds of mudchip lime wackestone dominate the overlying, grey Sombre detrital member. Symbols as on Figure 81 (legend) (ISPG Photo No. 1602-3).*

At the north end of Tundra Ridge a light grey limestone unit occurs at the base of the exposed part of the Vera Formation. At the base of Section 18 this limestone is a pelletal and oolitic packstone and grainstone containing large crossbed sets up to 1 m in amplitude. It underlies the typical pastel coloured rocks of the Vera Formation and may be traced for several kilometres. The significance of this limestone is not understood at present. It may be a local facies development or, less likely, it may be a sliver of some other formation incorporated into a fault splay off the Tundra Thrust.

The Vera Formation occurs throughout the region of Root Basin in the Virginia Falls and Root River map areas. In the Virginia Falls map area the southern limit of the Vera Formation forms the outline of the Prairie Creek Embayment (Fig. 21). It is between 200 and 300 m thick along the Sombre Salient and along the northeast side of the embayment. The 271.5 m thickness of the Vera Formation at its type section, Section 7, is typical. Westward and southward, away from the embayment, the Vera thins and disappears into the Road River Formation.

Contact relationships, age and correlation

The Vera Formation is underlain by the Road River Formation with a conformable, transitional contact (Fig. 12). It is assumed that the Vera is underlain by the Road River Formation tongue where the lower contact of the Vera is not exposed, such as along Tundra Ridge. The Vera Formation is overlain conformably by the Camsell Formation with an abrupt contact, except on part of the west side of the Prairie Creek Embayment in the southern part of the Sombre Salient where the Vera is overlain by the Sombre Formation (Fig. 11). The Vera and Camsell formations visibly intertongue where their contact is well exposed, such as along the west side of Tundra Ridge, so that the top of the Vera Formation appears to become slightly younger northward (Fig. 37).

The Vera Formation passes southward into part of the orange siltstone member of the Cadillac Formation in the embayment area (Fig. 7). At the south end of Tundra Ridge the brownish orange strata in the upper part of the Root River Formation beneath the Camsell (Sec. 25) are probably correlative with the Vera Formation farther north on Tundra Ridge. Southwest of the Prairie Creek Embayment, strata of equivalent age to the Vera Formation are contained in the Road River shale (SDR). The Vera Formation is extensively exposed also in the Root River map area to the north (Fig. 7), and was included in the uppermost part of the Delorme Formation by Douglas and Norris (1961, 1976c) as a recessive interval of thin bedded, cryptograined limestone (Douglas and Norris, 1961, p. 10).

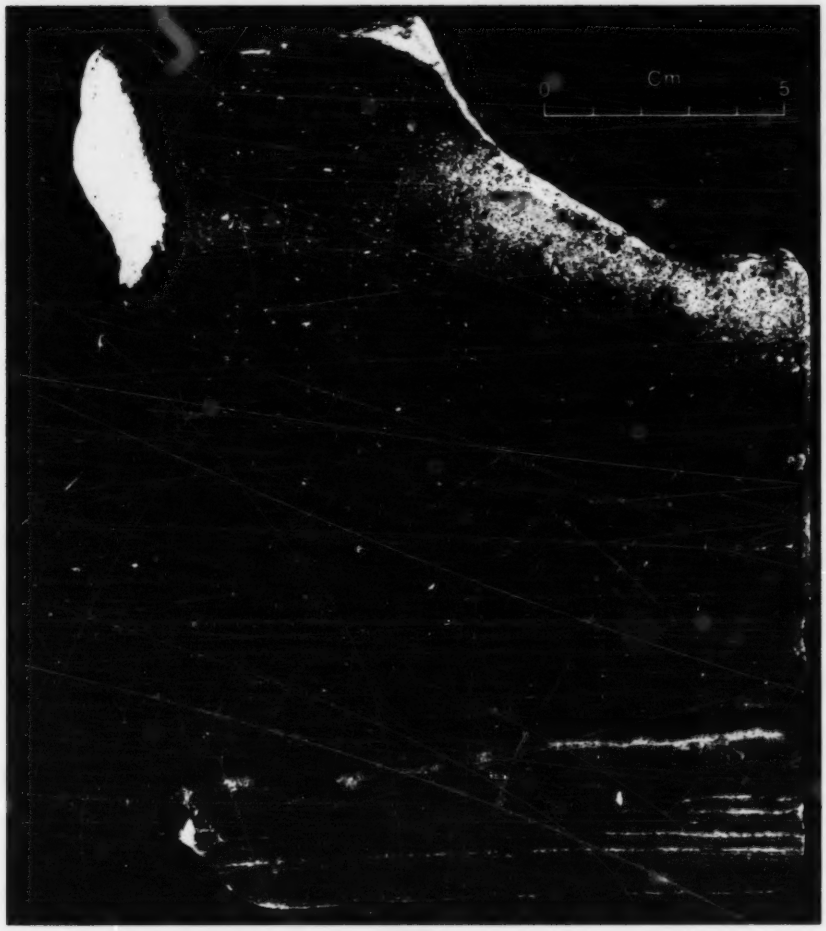


Figure 35. *A pinkish grey, lime wackestone, sediment gravity flow deposit in a sample from the pink shale member, 170.5 m above the base of the Cadillac Formation at Section 6. Base of flow has an angular erosional contact with the underlying pink, argillaceous, laminated lime mudstone. Lime mudlumps in the lower part of the flow deposit are dark grey, unlike the underlying pink sediments (ISPG Photo No. 1451-4).*

The Vera Formation is dated uniformly as earliest Early Devonian (Lochkovian) (Appendix 2). The Vera Formation at Section 1 has been the subject of a detailed biostratigraphic study by Norris and Uyeno (1981) who assigned these Vera Formation strata to the 'Delorme' Formation and determined an early Early Devonian or Lochkovian age for the sequence primarily on the basis of conodonts and brachiopods. Brachiopod, which are particularly abundant and diverse, include forms such as *Schizophoria paraprima* Johnson, Boucot and Murphy, *Gypidula pelagica lux* Johnson, Boucot and Murphy, *Atrypa nieczlawiensis* Kozlowski, *Spirigerina marginaliformia*, and *Iridistrophia* sp. (Appendix 2). Norris and Uyeno (1981) documented brachiopod species from 13 genera in the Vera Formation at the Cathedral Mountain Section (Sec. 1). They suggested that this brachiopod assemblage is characteristic of the Gedinnian (i.e. Lochkovian) *Gypidula pelagica* Zone of Johnson (1977), which is widespread in Western and Arctic Canada.

Camsell Formation [Corridor Member (new name)]

Introduction

The name Camsell Formation (IDC) has been applied by Douglas and Norris (1961) to the resistant, ridge-forming limestones and breccia that succeed the Delorme Formation and are overlain by the Sombre Formation in the Root River map area. The Camsell Formation in the Root River map area is a "grey cryptograined limestone weathering light- to medium-grey and either in massive beds or brecciated on a large scale" with orange, yellow and red weathering breccia matrix (Douglas and Norris, 1961, p. 11). No type section for the Camsell Formation was designated but it is apparent that Douglas and Norris regarded the exposures of Camsell strata in the Whittaker (1400 ft/426.7 m thick) and Delorme (1570 ft/478.5 m thick) ranges in the Root River map area as typical.

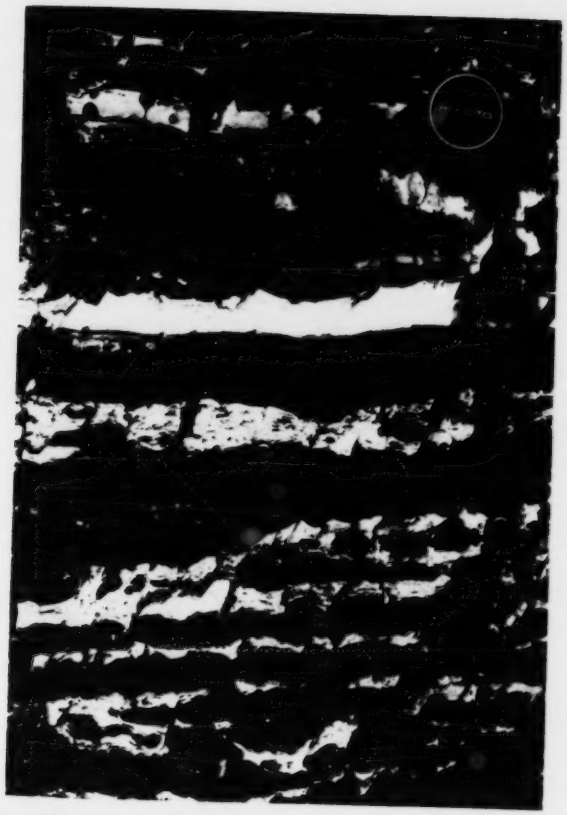


Figure 36. *The yellow striped facies of the Vera Formation. This facies appears to have been deposited in quiet water below wave base but in the photic zone. Bright yellow laminae of argillaceous lime mudstone separate thin, irregular, discontinuous beds of grey lime mudstone containing scattered crinoids and finger corals. Some fragments or parts of beds appear to have been isolated by interstratal slip. 177.5 m beneath the top of the Vera Formation in Section 3 (ISPG Photo No. 837-105).*

In south-central Root River map area, however, Douglas and Norris (1961) report that the Camsell is transitional into a bedded, nonbrecciated facies that consists of alternating, thick bedded, fine grained, medium grey weathering limestone, and shaly, fine grained, orange weathering, recessive limestone in a strongly colour banded sequence. This nonbrecciated, bedded facies of the Camsell extends southward into the Virginia Falls area, although silty dolostone takes the place of limestone in the central part of that area and is exposed along Tundra Ridge and, less extensively, along the Manetoe and Arnica ranges (Fig. 81, in pocket). Douglas and Norris (1976a) did not recognize the Camsell Formation along the Arnica Range.

More extensive mapping and analysis of the Camsell Formation in the Virginia Falls map area has led the writers to apply a formal name to the banded facies of the Camsell. We propose that the name Corridor Member be applied to this sequence and designate the Tundra Ridge Section, Section 18, as the type section (Fig. 81, in pocket; Appendix 1). Corridor Creek is an eastward flowing stream, immediately south of the type section (Fig. 3).

Lithology, sedimentary structures, distribution and thickness

The Corridor Member of the Camsell Formation in the Virginia Falls map area is composed of three distinctive lithologic facies: the limestone-sandstone facies; the dolostone-siltstone facies; and the anhydrite-siltstone facies (Fig. 9). The dolostone-siltstone facies is the most extensive and is present wherever the Corridor Member is exposed in the Virginia falls map area. The limestone-sandstone facies is confined to the lower parts of the northernmost sections along Tundra Ridge, sections 16, 17 and 18 (Fig. 19). The anhydrite-siltstone facies occurs only in the Pan Am A-1 Mattson Creek well in the subsurface of the southwest corner of the Sibbeston Lake map area (Fig. 9). Each of these facies is composed of several lithologies that are interbedded in a nearly cyclic or rhythmic manner. These lithologies are interbedded in intervals that have a modal thickness of 1 to 3 m, as is shown in Figure 38 (a plot of lithology interval thickness against frequency for Section 20).

Dolostone-siltstone facies

The dolostone-siltstone facies is characterized by regular alternations of dark grey to nearly black, thick bedded dolostone, light grey to white dolostone, and yellow silty dolostone (figs. 39, 40). Beds of dark grey dolostone commonly rest with a slight erosional contact on underlying lighter coloured dolostones, and small chips of the underlying dolostone may be present scattered near the base of the dark dolostone (Fig. 15). The overlying blocky, dark dolostone grades upward to flaggy or medium bedded, light grey, laminated dolostone, and finally to silty, light to bright yellow, platy dolostone. Fenestral fabric is common in the light grey laminites, and mudchips and mudcracked beds occur in the yellow silty dolostones (Fig. 41). Brownish orange, dolomitic, fine grained sandstone beds occur sporadically throughout the sequence in the northern part of the dolostone-siltstone facies. These medium to thick beds of fine grained sandstone are planar laminated with some small ripples (Fig. 42), but were not observed to contain any larger scale sedimentary structures. Farther south along Tundra Ridge, as for example in sections 21 and 22, these sandstone beds are fewer in number and thinner and are composed of polished, rounded quartz grains. These southernmost sandstone beds weather light pinkish yellow.

Limestone-sandstone facies

The limestone-sandstone facies is similar to the dolostone-siltstone facies in that both are formed of a variety of interbedded rock types. The contact between these facies is gradational. Section 18 marks the southern limit of the limestone-sandstone facies (Fig. 9). Dark and light grey lime mudstone and wackestone form a large part of the limestone-sandstone facies, although a few dark and light grey dolostone beds also occur.

The dark grey lime mudstone beds are commonly bioturbated, and some contain recognizable, infilled, curvilinear, non-branching, subhorizontal burrows (Fig. 43), possibly of the ichnofossil genus *Planolites* (Nicholson, 1873). This type of horizontal burrower is thought to characterize the shallow subtidal zone (Rhoads, 1967). In this facies there is a general absence of many of the tidal flat indicators that characterize the dolostone-siltstone facies.

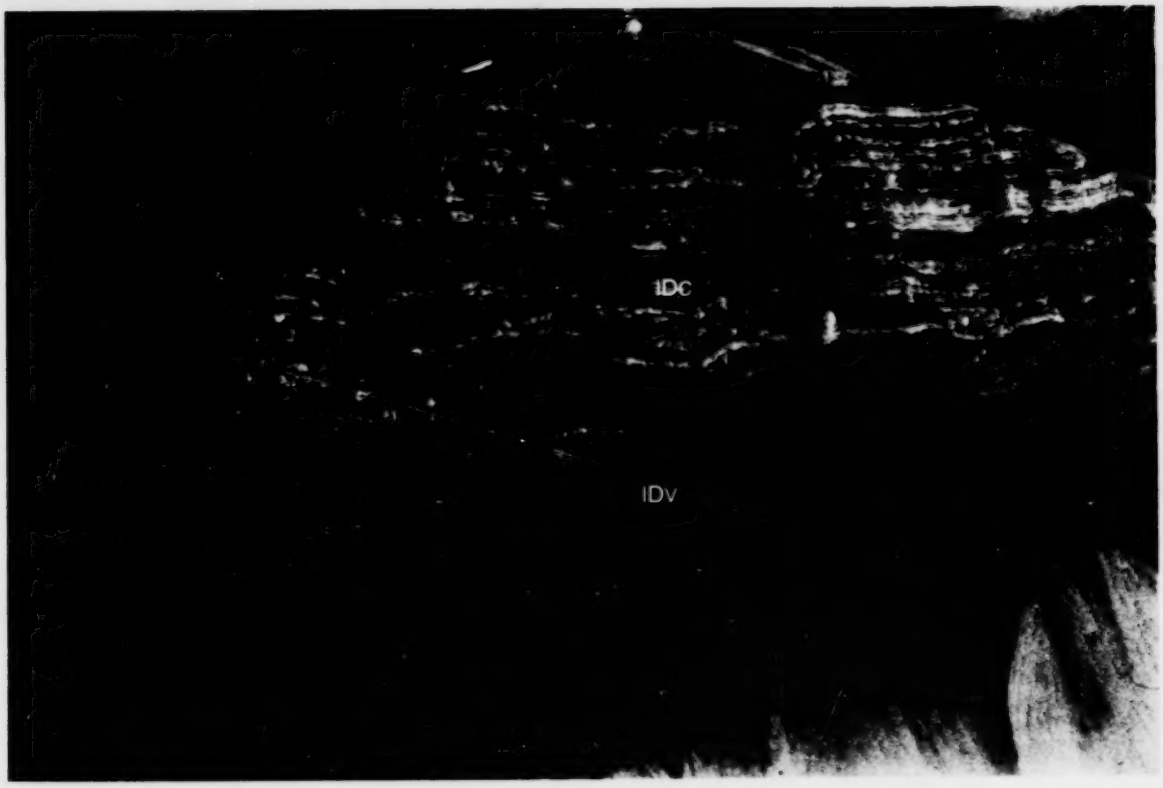


Figure 37. *Bright yellow, banded, silty dolostones of the Camsell Formation overlying medium- to light-brown weathering, argillaceous lime mudstones of the Vera Formation with an intertonguing contact that rises gradually northward (to the left). Looking eastward at the exposed hanging wall of the westward directed Tundra Thrust, on Tundra Ridge immediately north of Section 20. Symbols as on Figure 81 (legend) (ISPG Photo No. 837-7).*

Some medium and dark grey lime mudstone and dolomitized lime mudstone beds contain angular, lighter grey carbonate fragments, many of which have been plastically deformed. Some of these breccia-bearing beds contain slump folds that are outlined by contorted zones of light coloured carbonate in a darker matrix (Fig. 44). Some yellowish grey and light grey dolostone and limestone beds are mudcracked and contain mudchips.

Brownish orange weathering intervals of fine grained sandstone are more common in this facies than in the dolostone-siltstone facies. These sandstones are devoid of large scale sedimentary structures and are commonly planar laminated. They are similar to the orange weathering siltstones and fine sandstones of the orange siltstone member of the Cadillac Formation.

Anhydrite-siltstone facies

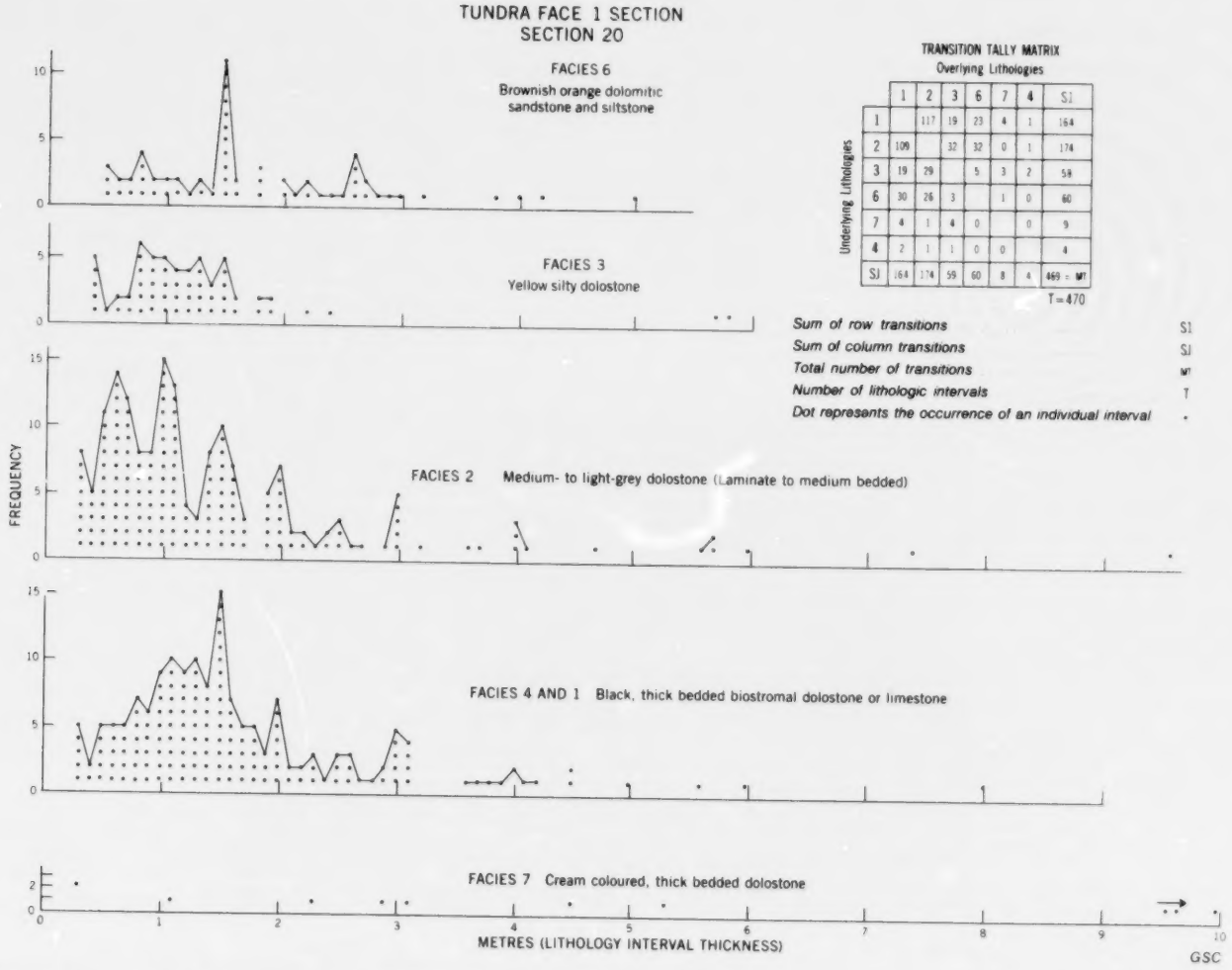
The anhydrite-siltstone facies was encountered only in the Mattson Creek well. This facies is similar to the dolostone-siltstone facies except that anhydrite interbeds are common.

Statistical data concerning lithologic variations

The colour banding or striping of the Corridor Member is far more pronounced in the northern area of its exposure than in the southern part. The progressive southward decrease in the number of lithologic transitions in the Corridor Member exposed on Tundra Ridge produces the southward change from an intensely colour banded sequence to a sequence in which the colour banding is far less evident. A quantification of this observation may be seen by comparing the number of lithologic transitions in northern sections, such as Section 17 (580 lithologic transitions), with the corresponding number in southern sections, such as Section 21 (193 lithologic transitions) and in intermediate sections (Fig. 45). The northernmost section, Section 16, contains relatively few transitions because it is almost entirely composed of the limestone-sandstone facies, unlike sections 17, 20 and 21, which are composed of the dolomite-siltstone facies (Fig. 9).

Field observations suggest that the sequence of dark carbonate passing upward to lighter coloured carbonate is the most constantly repeated component of the entire lithologic

sequence in the Corridor Member. Markov chain analysis, using the 'embedded Markov chain' type of Krumbein and Dacey (1969) and Miall (1973) confirms this observation in the four sections in which the lithologic transitions were recorded. The upward transition of dark to light carbonate, dolostone or limestone is a favoured lithologic transition in all sections (Fig. 45), although the upward transition from light to dark is almost as common, giving rise to a very repetitive sequence of light and dark grey carbonates. The relatively large number of transitions involving light and dark grey dolostone in all these sections suggests that these favoured transitions are statistically significant. The other favoured lithologic transitions involving yellow, dolomitic siltstone (St3) and brownish orange, sandy dolostone (SS6) may not be statistically significant because too few transitions involving these lithologies are present. For example, in Section 20, yellow dolomitic siltstone (St3) exhibits a strong positive correlation with underlying dark grey limestone (L4) in the difference matrix (Fig. 45). Positive entries in the difference matrix indicate which transitions have occurred with greater than random frequency (Miall, 1973) but the positive correlation between dark grey limestone (L4) and yellow dolomitic siltstone (St3) is based on only one lithologic transition. Conversely, the negative correlation between the yellow dolomitic siltstone (St3) and the light and dark dolostone (D2 and D1) is misleading in that 51 out of the total of 59 upward lithologic transitions to yellow dolomitic siltstone (St3) are from the light and dark grey dolostone (D2 and D1). A variety of statistical tests of significance have been proposed to determine whether the values in the difference matrix of an embedded Markov chain are statistically significant (Billingsley, 1961; Gingerich, 1969; Harbaugh and Bonham-Carter, 1970; and Miall, 1973) but a recent study by Vrbik (1977) has shown that these methods are invalid. At present, no easily applied objective test of significance appears to exist for the embedded Markov analysis. At best, this type of Markov analysis provides a qualitative estimate of the degree to which the various lithologic transitions are favoured relative to purely random transitions.


TUNDRA FACE 1 SECTION
SECTION 20
FACIES 6
Brownish orange dolomitic sandstone and siltstone
FACIES 3
Yellow silty dolostone
FACIES 2 Medium- to light-grey dolostone (Laminate to medium bedded)
FACIES 4 AND 1 Black, thick bedded biostromal dolostone or limestone
FACIES 7 Cream coloured, thick bedded dolostone
FREQUENCY
METRES (LITHOLOGY INTERVAL THICKNESS)
TRANSITION TALLY MATRIX
Overlying Lithologies
Underlying Lithologies
Sum of row transitions
Sum of column transitions
Total number of transitions
Number of lithologic intervals
Dot represents the occurrence of an individual interval
GSC

	1	2	3	6	7	4	SI
1		117	19	23	4	1	164
2	109		32	32	0	1	174
3	19	29		5	3	2	58
6	30	26	3		1	0	60
7	4	1	4	0		0	9
4	2	1	1	0	0		4
SJ	164	174	59	60	8	4	469 = MT

T=470

Figure 38. *A plot of the frequency of occurrence of discrete interval thicknesses for individual lithologies within the Corridor Member of the Camsell Formation in Section 20. Most of these lithologies have a modal thickness of one to three metres. Each dot represents the occurrence of an individual interval.*

Thickness data

The Corridor Member thickens northward across the Virginia Falls map area from a thin southern section, 402.5 m thick in the Mattson Creek well, (Sec. 42) to the thicker northern sections such as Section 17 which is 1143.8 m thick (Fig. 9). The Corridor Member exposed along the Manetoe and Arnica ranges is of intermediate thickness. In general, the Corridor Member thins westward from Tundra Ridge, around the north end of the Prairie Creek Embayment, to the Manetoe and Arnica ranges and disappears west of the Arnica Range, so that the Sombre Formation rests directly on the Vera Formation in the area around Cathedral Mountain (Fig. 22). The Corridor Member also disappears beneath the Sombre Formation in the southern part of the Manetoe and Arnica ranges.

Contact relationships, age and correlation

Two circumstances make correlation of the Corridor Member of the Camsell Formation with other units uncertain. The first is the fact that no datable macro- or microfaunas were obtained during this study from the Corridor Member, and the second is the discontinuous aspect of the Corridor Member. The three main possibilities for the eastward correlation of the Corridor Member are shown in Figure 19 and have been discussed previously. It is most likely that the Corridor Member passes eastward into the 'Silurian-Devonian undivided' sequence in the Red Rock Pass Section (Fig. 19). Some intertonguing between the Corridor and the overlying Sombre Formation may occur east of Tundra Ridge (Fig. 11) and between the Corridor Member and the underlying Vera Formation (Fig. 9) northward along Tundra Ridge.

The uniform, Early Devonian, Lochkovian age of the Vera Formation throughout the Virginia Falls and Root River map areas indicates that, in the region of the Sombre Salient on the west side of the Prairie Creek Embayment, the Corridor Member passes laterally westward into the Sombre Formation. Northward, the Corridor Member passes into the limestone breccia of the type facies of the Camsell Formation in the Root River map area (Douglas and Norris, 1976c).

The age of the Corridor Member is probably Early Devonian (Lochkovian) to middle Early Devonian (Pragian) based on its stratigraphic position between the early Devonian Vera Formation and the middle to late Early Devonian Sombre Formation.

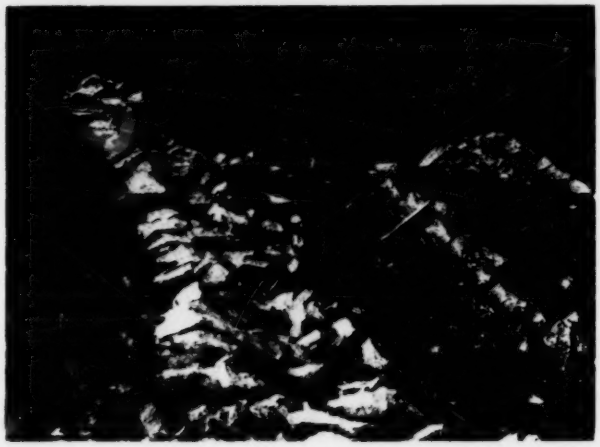


Figure 39. *A typical cyclic or hemicyclic peritidal sequence in the dolostone-siltstone facies of the Corridor Member of the Camsell Formation. Vuggy, dark grey, subtidal dolostone at the extreme left grades upward to light yellowish grey dolomicrite, in turn overlain by a crossbedded, orange siltstone. 383 m above the base of the Camsell Formation in Section 18 (ISPG Photo No. 710-15).*

Figure 40. *Looking northwest at the Vera, Camsell and Sombre formations in Section 16. This section is 8 kilometres north of the type sections of the Corridor Member of the Camsell Formation and the Sombre Formation. Symbols as on Figure 81 (legend) (ISPG Photo No. 837-1).*

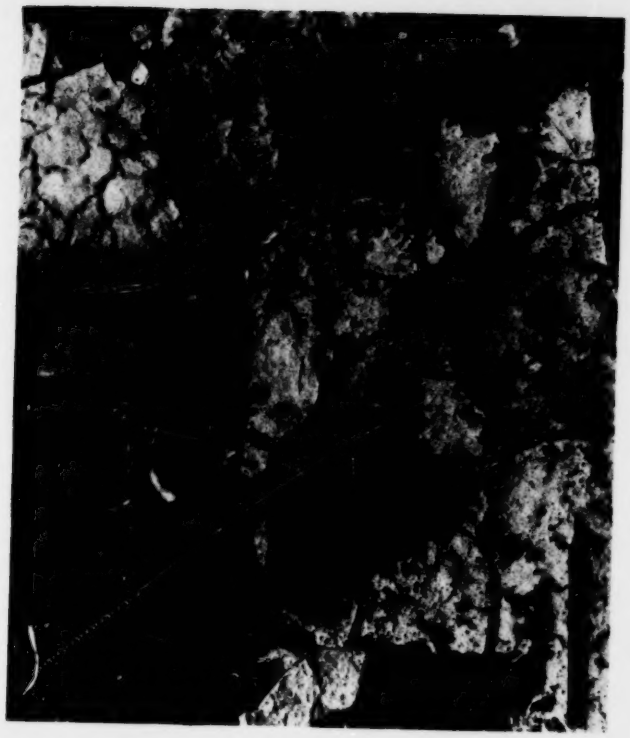


Figure 41. *Mudcracked bed surfaces in greenish orange weathering, dolomitic siltstone and shale in the dolostone-siltstone facies of the Corridor Member of the Camsell Formation in Section 30, 8 m above the base of the Camsell Formation. This orange weathering interval at the base of the Camsell Formation in the Headless Range is a local marker unit and may be coeval with the Vera Formation farther north (iSPG Photo No. 837-134).*

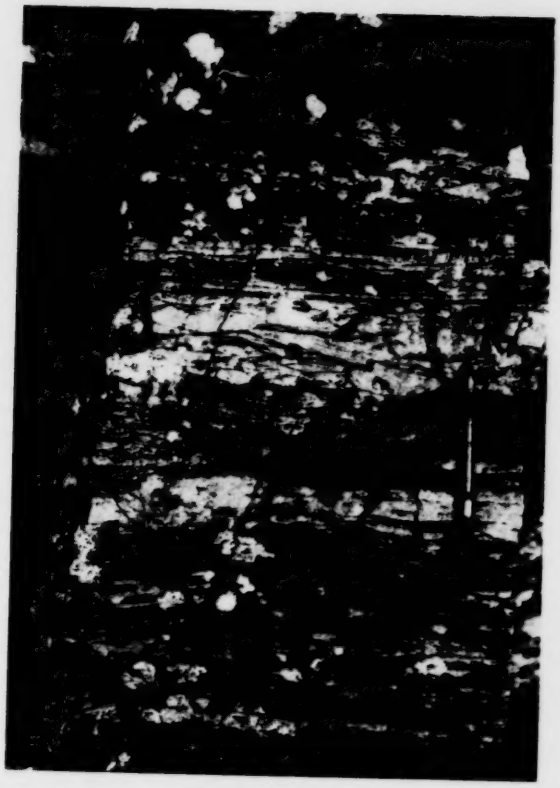


Figure 42. *Light orange-brown (buff) weathering, finely laminated and ripple marked (some interference ripples), fine grained quartzarenite (sandstone), 879 m above the base of the Camsell Formation (Corridor Member) in Section 16 (ISPG Photo No. 837-130).*

DEPOSITIONAL AND TECTONIC SUMMARY OF THE LOWER CADILLAC PHASE OF THE PRAIRIE CREEK ASSEMBLAGE

The end of deposition of the Mount Kindle-Root River assemblage was marked by the introduction of orange silts of the Cadillac Formation into Root Basin (Fig. 4). This influx of relatively coarse, terrigenous material was probably contemporaneous with the Late Silurian drop in sea level that caused large areas of the North American craton to be exposed. Silt and sand eroded from these regions probably bypassed the Root River carbonate shelf on the eastern side of Root Basin. This is inferred from the westward-thinning wedge of Late Silurian orange siltstones that developed in the Virginia Falls map area at the south end of the Root Basin. This wedge of Late Silurian sediments in the lower part of the Cadillac Formation appears to have been a westward-prograding mudbank. This mudbank appears to have built out westward from the Root River shelf edge, which may have formed a submarine escarpment. Crinoid-, brachiopod-, and coral-bearing mounds populated the shallower parts of this mudbank near the Root River shelf edge (Fig. 46) as may be seen at the spectacular cliff exposure along the south end of Tundra Ridge (Fig. 31). Lime grainstone and packstone turbidite-like sediment gravity flows were shed off the flanks of these mounds and extended farther westward down the slope (Fig. 46).

Many mounds have moved *en masse* or slid down the slope of the orange siltstone mudstone during or shortly after deposition, causing the development of the brecciated fabric characteristic of the Cadillac megabreccia member. Seismic disturbances may have been responsible for initiating these movements and also for initiating the turbidites shed off the flanks of mounds. Some turbidites may have been initiated by storms but it is less likely that the downslope movement of mounds could have been caused by storms. These disturbances may also have caused the brecciation of some lime muds on the shelf to form the breccia beds in the limestone-sandstone facies of the Corridor Member.

In earliest Devonian time, Root Basin was partly filled with sediment and the west and north sides of the Prairie Creek Embayment began to take form at the south end of Root Basin in the Virginia Falls map area. This partial filling of Root Basin is indicated by deposition, in the photic zone, of the argillaceous, skeletal, lime wackestones of the Vera Formation, the southern limit of which is coincident with the outline of the Prairie Creek Embayment in its later, mature form. Tectonic intervention in the form of uplift along the axis of Redstone Arch seems necessary to explain the fact that the west side of the embayment, the Sombre Salient, which previously was the site of deeper water Road River deposition, became an area of shallow water deposition in the photic zone. The depositional interface in the embayment itself remained below wave base and below the photic zone.

Figure 43. *Bedding plane view of subhorizontal, curvilinear, infilled burrows, possibly of the genus* ***Planolites*** *(Nicholson, 1873), in dark grey lime mudstone of the limestone-sandstone facies of the Corridor Member of the Camsell Formation. 19.7 m above the base of the Camsell Formation in Section 20 (ISPG Photo No. 710-49).*

Figure 44. *Penecontemporaneously deformed, brecciated, light grey to white dolomicrite in a medium grey dolostone matrix, in the limestone-sandstone facies of the Corridor Member of the Camsell Formation in Section 17. Angular, but plastically deformed, clasts float in a medium grey matrix above some highly contorted light grey bands. 171.5 m beneath the top of the Camsell Formation (ISPG Photo No. 1457-1).*

The Lower Cadillac phase of the Prairie Creek assemblage ended with the general shallow water, peritidal deposition of the Corridor Member of the Camsell Formation around the Prairie Creek Embayment, except along the west side of Sombre Salient (Fig. 22). Deposition of the Corridor Member was dominated by large intertidal areas or islands separated by expanses of subtidal sedimentation. The lateral movement of these islands, during sedimentation-subsidence and the Early Devonian sea level rise, may have induced the development of the interbedded lithologies characteristic of the Corridor Member. In some places, stromatoporoid- and coal-bearing mounds developed in the subtidal areas.

It is inferred that silts and sands moved southwestward in the embayment across this area of shoals, particularly across the area of largely subtidal deposition occupied by the limestone-sandstone facies (Fig. 22). Some of these sands were reworked into beaches bordering the carbonate shoals in the dolomite siltstone facies. Probably the Sombre Formation began to be deposited on the west side of Sombre Salient contemporaneously with the Corridor Member on the east side, because the southwestern part of the salient was too distant from the source of the terrigenous influx to receive silty carbonate deposition. An alternate possibility, considered much less likely, is that deposition of the Vera Formation continued on the west side of the salient during the accumulation of the Corridor Member on the east side.

Southwest and west beyond the embayment, Road River argillaceous limestone and shale accumulated in the Selwyn Basin during deposition of the entire Lower Cadillac phase of the Prairie Creek assemblage.

Figure 45. *A single-step Markovian characterization of interbedded lithologies in the Corridor Member of the Camsell Formation. The lithology code applies to all sections. This figure tabulates the Markovian characterizations of sections 16, 17, 20 and 21.*

Notes: The single step lithology transition count matrix is a simple tally matrix showing the number of times a given lithology along a row passes upward to the lithologies illustrated in the columns. The independent trials matrix is a measure of the probability that a given transition occurs randomly. The transition probability matrix indicates the actual probability that a given lithologic transition occurs. The difference matrix indicates which transitions have occurred with greater than random frequency. Details concerning this type of Markov analysis are contained in Miall (1973) and Gingerich (1969). The favoured lithologic transitions are shown with a solid line if the corresponding value d_{ij} *is <0.20, and with a dashed line if this value is contained in the interval* $1.0 < d_{ij} < 0.20$.

TUNDRA FACE 1 (Section 20)

Single step lithology transition count matrix

	D1	D2	St3	SS6	D7	L4	TOTAL
D1	0	117	19	23	4	1	164
D2	109	0	32	32	0	1	174
St3	19	29	0	5	3	2	58
SS6	30	26	3	0	1	0	60
D7	4	1	4	0	0	0	10
L4	2	1	1	0	0	0	4
							469

Independent trials matrix (r_{ij})

D1	.000	.569	.193	.196	.023	.013
D2	.559	.000	.200	.203	.024	.014
St3	.401	.423	.000	.146	.017	.010
SS6	.403	.425	.144	.000	.017	.010
D7	.359	.379	.129	.131	.000	.009
L4	.355	.374	.127	.129	.015	.000

Transition probability matrix (p_{ij})

D1	.000	.718	.117	.141	.018	.006
D2	.626	.000	.184	.184	.000	.006
St3	.328	.500	.000	.086	.052	.034
SS6	.500	.433	.050	.000	.017	.000
D7	.500	.100	.400	.000	.000	.000
L4	.500	.250	.250	.000	.000	.000

Difference matrix (d_{ij})

D1	.000	.149	-.076	.055	.004	-.007
D2	.067	.000	-.016	.019	-.024	.008
St3	.074	.077	.000	.060	.035	.025
SS6	.097	-.008	.094	.000	.000	.010
D7	.141	.279	.271	-.131	.000	.009
L4	.145	.124	.123	-.129	.015	.000

Favoured Lithologic Transions

D2 ← D1 ← D7
↑ ↓
L4 → St3

SOUTH TUNDRA 2 (Section 21)

Single step lithology transition count matrix

	D1	D2	St3	SS6	D7	TOTAL
D1	0	30	3	12	7	52
D2	23	0	5	9	3	37
St3	7	1	0	0	28	36
SS6	15	5	0	0	4	24
D7	7	1	28	4	0	40
						185

Independent trials matrix (r_{ij})

D1	.000	.277	.255	.170	.298
D2	.338	.000	.234	.156	.273
St3	.331	.248	.000	.153	.268
SS6	.308	.231	.213	.000	.249
D7	.334	.258	.236	.159	.000

Transition probability matrix (p_{ij})

D1	.000	.577	.058	.231	.135
D2	.590	.000	.128	.205	.077
St3	.194	.028	.000	.000	.778
SS6	.625	.208	.000	.000	.167
D7	.167	.071	.667	.095	.000

Difference matrix (d_{ij})

D1	.000	.300	-.198	.061	-.163
D2	.252	.000	-.106	.049	-.196
St3	.137	.221	.000	.153	-.510
SS6	.317	.022	-.213	.000	-.082
D7	.178	-.187	.428	.064	.000

Favoured Lithologic Transitions

SS6 → D1 ⇌ D2 St3 ⇌ D7

NORTH TUNDRA 1 (Section 16)

Single step lithology transition count matrix

	D1	D2	St3	L4	L5	SS6	TOTAL
D1	0	25	7	1	1	6	40
D2	25	0	21	13	1	21	81
St3	9	18	0	9	17	1	54
L4	0	14	4	0	13	4	35
L5	2	1	17	10	0	5	35
SS6	4	22	6	2	3	0	37
							282

Independent trials matrix (r_{ij})

D1	.000	.332	.228	.141	.145	.154
D2	.200	.000	.275	.170	.175	.185
St3	.175	.351	.000	.149	.154	.162
L4	.163	.325	.224	.000	.142	.150
L5	.163	.325	.224	.138	.000	.150
SS6	.164	.328	.225	.139	.143	.000

Transition probability matrix (p_{ij})

D1	.000	.625	.175	.025	.025	.150
D2	.309	.000	.259	.160	.012	.259
St3	.170	.340	.000	.151	.321	.019
L4	.000	.400	.114	.000	.371	.114
L5	.057	.029	.486	.286	.000	.143
SS6	.108	.595	.162	.054	.081	.000

Difference matrix ($d_{ij} = (p_{ij} - r_{ij})$)

D1	.000	.293	-.053	-.116	-.120	-.004
D2	-.109	.000	-.016	-.010	-.163	-.074
St3	-.006	-.011	.000	-.002	-.167	-.143
L4	-.163	-.075	-.109	.000	-.229	-.036
L5	-.105	-.297	-.262	-.148	.000	-.008
SS6	-.056	-.267	-.063	-.085	-.062	.000

Favoured Lithologic Transitions

D1 ⇌ D2 ← SS6 L4 ⇌ L5 ⇌ St3

NORTH TUNDRA 2 (Section 17)

Single step lithology transition count matrix

	D1	D2	St3	L4	L5	SS6	TOTAL
D1	0	109	15	0	3	16	159
D2	92	0	38	10	0	31	171
St3	25	29	0	9	8	17	88
L4	2	6	10	0	16	3	37
L5	2	0	10	14	0	2	28
SS6	23	27	14	4	1	0	69
							536

Independent trials matrix (r_{ij})

D1	.000	.439	.221	.086	.067	.181
D2	.413	.000	.237	.092	.071	.194
St3	.332	.379	.000	.074	.057	.156
L4	.299	.341	.172	.000	.052	.140
L5	.293	.335	.168	.065	.000	.137
SS6	.321	.367	.185	.071	.056	.000

Transition probability matrix (p_{ij})

D1	.000	.748	.107	.000	.019	.126
D2	.548	.000	.223	.053	.000	.176
St3	.283	.348	.000	.087	.087	.196
L4	.053	.158	.289	.000	.421	.079
L5	.074	.000	.333	.519	.000	.074
SS6	.382	.368	.184	.053	.013	.000

Difference matrix (d_{ij})

D1	.000	.309	-.114	-.086	-.048	-.055
D2	-.135	.000	-.014	-.039	-.071	-.018
St3	-.049	-.031	.000	-.013	-.030	-.040
L4	-.246	-.183	-.118	.000	-.369	-.061
L5	-.219	-.335	-.165	-.453	.000	-.063
SS6	-.060	.000	.000	-.019	-.042	.000

Favoured Lithologic Transitions

D1 ⇌ D2 L4 ⇌ L5 → St3

LITHOLOGY CODE

D1 *Black, dark grey dolostone*
D2 *Grey to light grey, laminated dolostone*
St3 *Yellow, dolomitic siltstone*
L4 *Dark grey limestone*
L5 *Light grey limestone*
SS6 *Brownish-orange, sandy dolostone*
D7 *Cream coloured, thick bedded dolostone*

GSC

Figure 45

THE UPPER CADILLAC PHASE OF THE PRAIRIE CREEK ASSEMBLAGE

Sombre Formation

Introduction

The Sombre Formation (lmDS) is exposed widely in the Virginia Falls map area but is not exposed farther east. It has been mapped extensively north of Virginia Falls in the western part of the Mackenize Mountains as far north as the Sekwi Mountain map area (105P) (Blusson, 1971). It was named by Douglas and Norris (1961, p. 14) for the resistant, thick bedded, grey weathering, colour banded dolomites (Douglas and Norris, *ibid.*) that overlie the Camsell Formation and underlie the Arnica. Section 18, at 61°58'N latitude and 124°54'W longitude, was designated by Douglas and Norris (*ibid.*) to be the type section (Appendix 1). The Sombre is 1250.5 m (4100 ft) thick at this section as indicated by Douglas and Norris (1961), but the thickness of the Sombre Formation at the type section (Fig. 47), as measured for this report, is slightly less at 1101.5 m (3614 ft).

The Sombre Formation in the Virginia Falls map area is divided into two parts, the main body of the Sombre developed throughout the Mackenzie shelf, and a separate facies, the detrital member of the Sombre Formation, appears to have been developed mainly along the margin of the Prairie Creek Embayment.

Lithology, sedimentary structures, distribution and thickness

Sombre Formation (shelf facies)

The Sombre Formation in the shelf sequence is composed of very thick to thin bedded, medium to light grey, finely crystalline dolostone. Throughout most of the area the Sombre Formation may be divided into three parts: a lower part, about 300 m thick, in which cycles of medium grey, thick bedded dolostone grade upward to light grey or almost white, laminated dolostone; a thin, dark middle band of bituminous, vuggy and coralline dolostone, about 75 m thick; and a thick upper part, about 600 m thick, composed of cyclic, medium to light grey dolostone with some darker, thicker beds toward the top (Fig. 47). The individual thicknesses of these Sombre subdivisions vary considerably throughout the area and, in the southern part of the exposed Sombre near the South Nahanni River, the middle, biostromal, dark band is not present. The extent of this dark coralline biostromal band in the Virginia Falls map area (lmDS2, Fig. 81, in pocket) is also shown by Douglas and Norris (1976a).

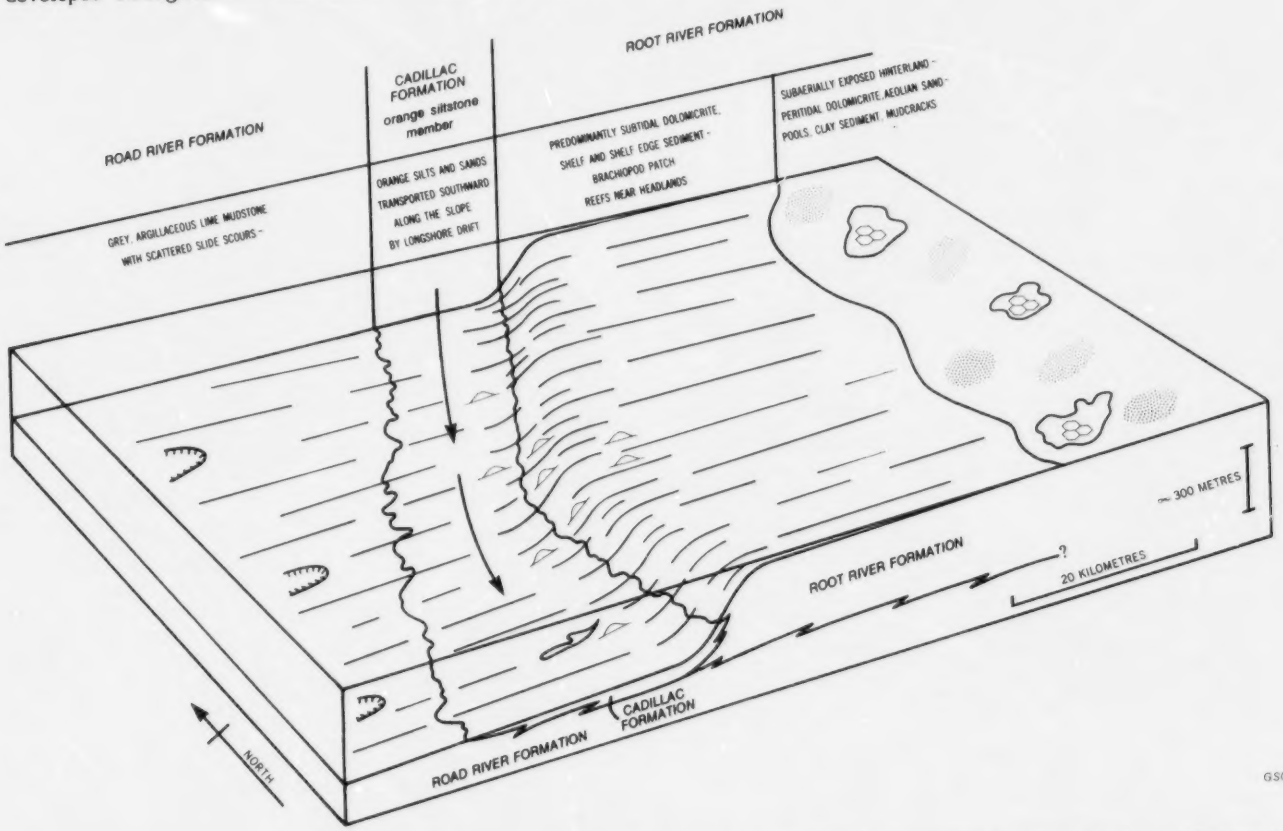

ROOT RIVER FORMATION
CADILLAC FORMATION
orange siltstone member
ROAD RIVER FORMATION
SUBAERIALLY EXPOSED HINTERLAND - PERITIDAL DOLOMICRITE, AEOLIAN SAND - POOLS, CLAY SEDIMENT, MUDCRACKS
PREDOMINANTLY SUBTIDAL DOLOMICRITE, SHELF AND SHELF EDGE SEDIMENT - BRACHIOPOD PATCH REEFS NEAR HEADLANDS
ORANGE SILTS AND SANDS TRANSPORTED SOUTHWARD ALONG THE SLOPE BY LONGSHORE DRIFT
GREY, ARGILLACEOUS LIME MUDSTONE WITH SCATTERED SLIDE SCOURS -
~ 300 METRES
ROOT RIVER FORMATION
?
20 KILOMETRES
CADILLAC FORMATION
ROAD RIVER FORMATION
NORTH
GSC

Figure 46. *Schematic block diagram of paleogeographic elements during deposition of the orange siltstone member. Silt detritus was transported, possibly by longshore currents, along the Root River shelf edge to form a westward-sloping wedge of sediment that built out over shales of the Road River Formation.*

Toward the southern part of the Sombre exposure, the upper part of the formation contains thicker intervals of darker grey, thick bedded dolostone that are very crinoidal, including the two-holed crinoid *Gasterocoma bicaula*, with fewer intervals of lighter grey, laminated dolostone. Also, in this southern region of exposure, the lower part of the Sombre includes intervals containing terrigenous material. Bimodal, medium grained, quartzarenite sandstone (Fig. 48) occurs as recessive intervals (0.25 m thick) in the lowermost 50 m of some southern sections of the Sombre Formation. Also, argillaceous silt and clay impart a yellowish or pinkish hue to many lighter grey laminated intervals in southern sections, such as sections 27, 28, 29, and 30.

The Sombre does not extend as far east as the Nahanni Range but it does extend northward beyond the study area. The combined thickness of the Arnica and Sombre formations is more significant than the thickness of either separately, because they are largely coeval and together represent a depositional unit. In general, where the Sombre is thick the Arnica is thin, particularly in sections perpendicular to depositional strike around the Prairie Creek Embayment. The Sombre Formation tends to be very thick (in places more than 1000 m) at the shelf edge of the embayment where the Arnica is relatively thin (Fig. 11). The Sombre becomes thinner landward from the shelf edge and disappears east of the Mackenzie Plain (Fig. 11). The combined thickness of the Arnica and Sombre formations ranges approximately from 1000 to 1400 m in the area around the Prairie Embayment.

The intervals of light grey, laminated dolomicrite contain sedimentary features indicative of intertidal deposition, such as: fenestral fabrics, commonly associated with pelletal or intraclastic texture (e.g. in unit 8 of Sec. 27); algal-like fine laminations (e.g. in unit 34 of Sec. 30); probable intralaminar shrinkage cracks (Davies, 1970); and carbonate mudchip breccias (e.g. in unit 9 of Sec. 29). Some of the algal laminated sequences contain disharmonic folds (Fig. 49) that resemble the algal mat overfolds described by Davies (1970). The proportion of intertidal intervals in the Sombre appears to be about one fifth to one third of the total Sombre sequence. The tidal flats that these intervals represent may have been occupied by relatively oxygenated groundwater that bleached the underlying subtidal intervals (Fig. 50).

An unusual, previously undescribed, sedimentary feature occurs in some of the white, laminated dolostones of both the Sombre and Arnica formations. Large, euhedral, authigenic quartz crystals, up to 10 cm long, are scattered in abundance in some laminated intervals (e.g. in unit 19 in Sec. 29). These crystals have grown *in situ* by replacement of the carbonate mud but are incomplete replacements and the interiors of the crystals remain unreplaced (Fig. 51). Some of these crystals appear to have been broken by burial compaction. There do not appear to have been any pre-existing evaporite minerals such as have been documented by Folk and Pittman (1971) for chalcedony that has replaced anhydrite.

The medium grey, medium- to thick-bedded dolostones between the laminated dolostone intervals contain few sedimentary features. Many of these intervals have slightly erosional basal contacts with underlying light grey laminates and some semi-lithified, carbonate mudchips have been reworked from the lighter grey dolostone into the overlying medium grey dolostone. This phenomenon is more obvious in the overlying Arnica Formation because of the greater degree of colour contrast between subtidal and intertidal intervals in that formation. This feature has not been noted systematically in measured sections of the Sombre Formation (Appendix 3). Poorly preserved corals and stromatoporoids occur in some medium to thick beds and, in some places, these beds have local thickenings that may be patch mounds or bioherms (e.g. in unit 13 of Sec. 1).

Many sections of the Sombre Formation, including the type section on Tundra Ridge (Sec. 18), contain thick to very thick beds and massive beds of dolostone breccia (Fig. 52) that are similar to the penecontemporaneous breccias in the limestone-sandstone facies of the underlying Corridor Member (Fig. 44). This type of breccia is nonbedded with mud-supported, chaotically oriented, unsorted, angular fragments of light grey dolomicrite floating in a slightly darker grey dolomicrite matrix. There is a slight alignment of fragments parallel to bedding. Discernible fragments range from a few centimetres to a few metres in length, and some fragments have long, thin apophyses projecting into the mud matrix (Fig. 52). Many of these angular fragments appear to have been deformed plastically (Fig. 52), indicating that they were only partly lithified during brecciation. There is only a small amount of open space filling, white dolomite cement which fills shelter porosity that occurs between some closely packed clasts. The low colour contrast between the fragments and the matrix renders the identification of these breccias difficult, particularly on weathered surfaces. The thickness of individual breccia masses is commonly uncertain because of the difficulty in identifying this type of breccia on weathered surfaces and the discontinuity of exposures. Although most of these breccia bodies are only a few metres thick, some may be tens of metres thick, as, for example, the large breccia body in unit 66 of the type section of the Sombre Formation, in Section 18, which may be as much as 33 m thick. Their lateral extent also is hard to determine but may range from tens of metres to hundreds of metres. Correlation of individual breccia bodies between sections does not appear to be possible (Fig. 9).

These breccia bodies, like similar breccias in the limestone-sandstone facies of the underlying Corridor Member, probably resulted from the disruption of partly lithified, peritidal carbonate mudstones, in the depositional environments, by storms or by seismic activity. A previous interpretation (Morrow, 1975) of these breccia bodies as a solution-collapse phenomenon is rejected here because the individual fragments are very angular and plastically deformed in a carbonate mud matrix, unlike the solution-rounded, grain-supporting, lithified fragments that would be expected to form a cemented, grain-supporting, solution collapse breccia.

Some grain-supported mosaic and rubble breccias in the upper part of the Sombre Formation may be true solution collapse breccias (e.g. unit 15 in Sec. 28). These breccias have a very different aspect to the penecontemporaneous breccias described previously. The blocky, poorly sorted fragments in these breccias are incompletely cemented with white, coarsely crystalline dolomite. Euhedral, dogtooth quartz crystals encrust this dolomite cement in some of the larger interfragment spaces where dolomite cementation has been incomplete. Unlike the penecontemporaneous breccias, the solution-collapse breccias appear to have been completely lithified before brecciation occurred. No traces of evaporite minerals occur in the fragments or in the host dolostone.

Dolomitized intraclast grainstones, packstones and wackestones occur in the Sombre Formation at some localities near the shelf edge of the Prairie Creek Embayment. Unit 8 in the Sombre Formation at Section 29 is a particularly thick development of this lithology and some other occurrences were encountered near the top of the Sombre where its dolostones pass southward into limestone of the detritial member at the south end of the Manetoe Range.

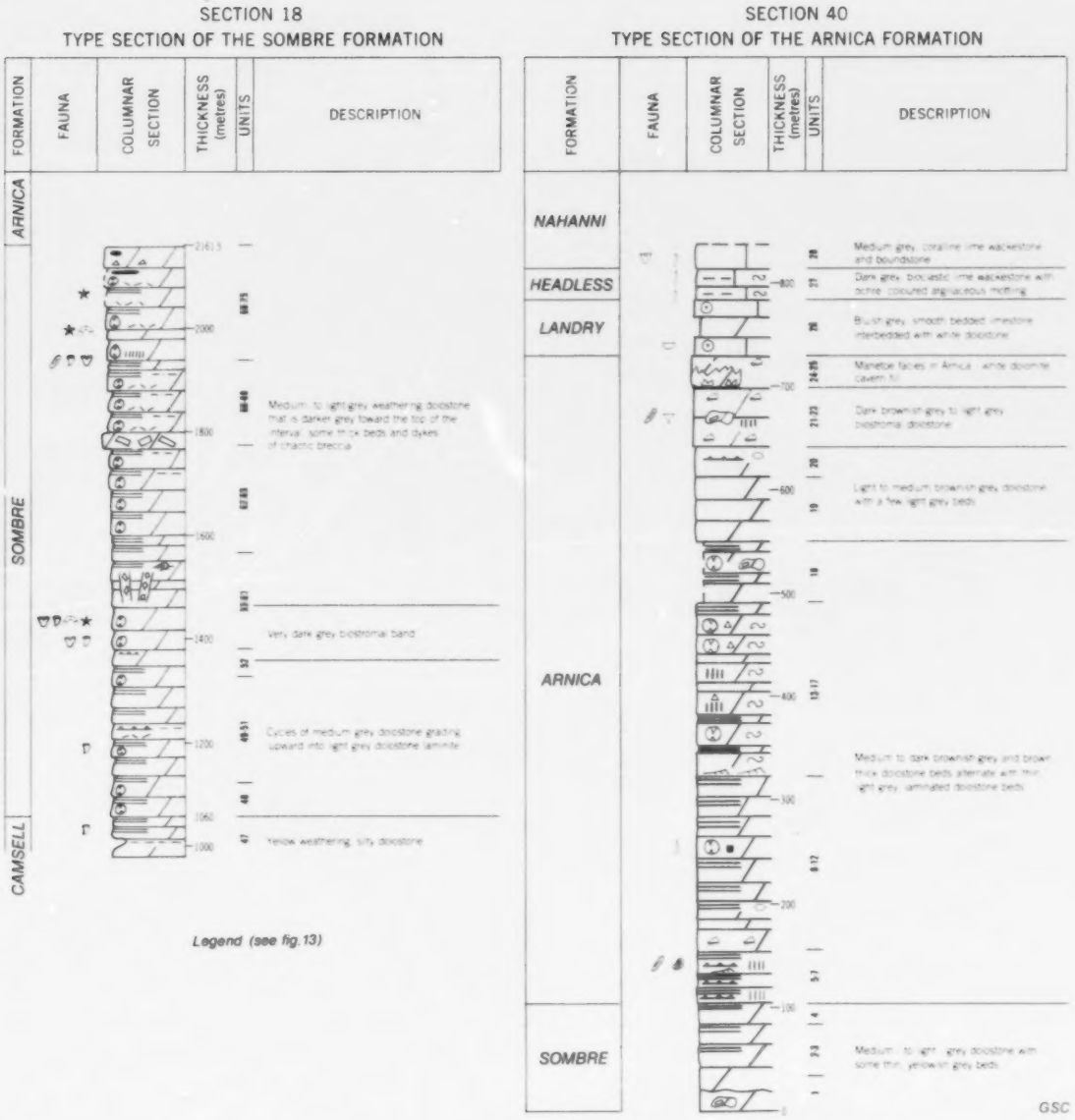


Figure 47. *Columnar sections for the shelf sequence Sombre Formation (type section), in Section 18; and the Arnica (type section), Landry and Headless formations and the Manetoe facies, in Section 40. The Sombre sequence displays the typical tripartite subdivision developed in the type area with thick, light grey upper and lower parts separated by a dark grey, bituminous, biostromal band. The Manetoe facies in Section 40 was previously regarded as the Manetoe Formation by Douglas and Norris (1961).*

The millimetre-sized, light grey, subangular fragments of pelletal laminite or pelletal wackestone that form these intraclastic rocks are set in a matrix that is slightly darker grey. In this section, some grains display fenestral fabric and contain fragments of green algae, crinoids and ostracodes. Many grains have micritized rims. There is a slight alignment of grains parallel to bedding. These detrital carbonates near the edge of the shelf sequence may be the source of the carbonate fragments in the sediment gravity flow deposits of the detrital member of the Sombre Formation.

Detrital member

The detrital member of the Sombre Formation is exposed mainly on the west side of the Prairie Creek Embayment at the south end of the Sombre Salient and also in an area at the northern apex of the embayment (Fig. 81, in pocket). Along the sides of the embayment, where the trends of the thrust faults are sub-parallel to the boundary between the detrital member and shelf Sombre, the detrital member may have been eroded from the Manetoe and Tundra thrust

plates. This is consistent with the preservation of the detrital member in areas where the facies boundary between this member and the shelf Sombre cuts across the trends of thrust faults, such as at the northern apex of the Prairie Creek Embayment and around the Sombre Salient. Alternatively, thrust plates may simply have overridden the detrital member in areas where the facies boundary is sub-parallel to the fault trends.

Section 6, at 61°46'N latitude and 125°06'W longitude (Fig. 53), is perhaps the most typical section through this member (figs. 13, 34; Appendix 1). At Section 6 the detrital member is 350 m thick and is composed of fine grained lime wackestone, packstone and grainstone sediment gravity flows. These deposits are dolomitized in the upper part of this section (Fig. 13). Typically, several fine grained turbidite-like deposits occur within a single smooth, planar, thin to thick bed (figs. 54, 55). Contacts between flows are planar and not markedly erosional. The clasts, which tend to be a lighter grey than the matrix, are predominantly lime mudstone or pelletal lime wackestone, and many clasts contain fenestral fabric and fragments of green algae (Fig. 55). Crinoid and brachiopod fragments (Fig. 13) are more common in the lower parts of the detrital member but scattered, small crinoid fragments occur in packstones and grainstones (figs. 13, 57) higher in the section. Many beds exhibit a slight degree of normal graded bedding and imbrication of elongate lime mudclasts (Fig. 55). The dip of imbrication appears to be toward the centre of the embayment. Graded bedding is not well developed because the clasts within a given flow deposit have only a small size range. In general, visible coarser fragments range in length from one millimetre to one centimetre (Fig. 56).

Some thinner bedded, hemipelagic, dark grey lime mudstones, with a faint pink tint, separate thicker intervals of resedimented, lighter grey turbidite-like deposits. These darker, thin bedded intervals are more common toward the base of the detrital member, near its contact with the pink shale member of the underlying Cadillac Formation. Mass flow deposits in the lower part of the detrital member are thinner, more fossiliferous, and commonly coarse grained than mass flow deposits in the upper part. Black and grey chert nodules, and some selective silicification of biogenic material, occur in the middle and upper parts of the detrital member (Fig. 13).

The total thickness of the detrital member, in the few places where it is completely exposed, ranges from about 250 to 350 m. It is coeval, and in facies contact with the pink shale member of the Cadillac Formation, which occupies the central region of the Prairie Creek Embayment. The upper part of the Sombre detrital member extends farther toward the basin centre than the lower part (Fig. 11).

Contact relationships, age, correlation and faunas

The Sombre Formation conformably overlies the Camsell Formation with a gradational contact that is transitional over several metres. On the west side of the Sombre Salient, where the Camsell Formation is not present, the Sombre sharply but conformably overlies the Vera Formation (Fig. 11). There may be some intertonguing between the Sombre Formation and the Corridor Member of the Camsell Formation, particularly westward across the Sombre Salient and also, perhaps, eastward from the Tundra Ridge area on the east side of the embayment (Fig. 11). However, the fairly constant thickness of the Corridor Member along a north-south line of section (Fig. 9) may indicate that the Sombre-Corridor contact is nearly isochronous in that direction. Douglas and Norris (1961, p. 11) suggested that the southward thinning of the Camsell Formation, from the Root River map area to the Virginia Falls map area, may be the result of pre-Sombre erosion, but no evidence supporting this possibility was observed during the present study.

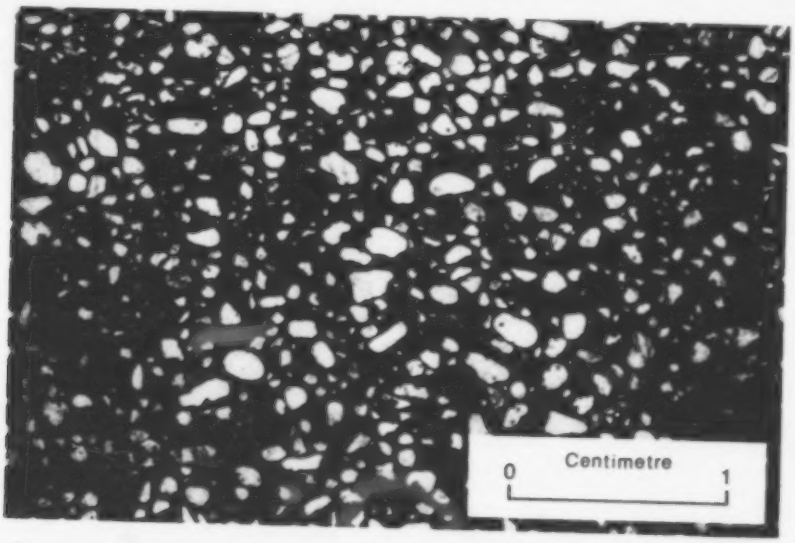


Figure 48. *Bimodal quartzarenite sandstone from 15 m above the base of the Sombre Formation in Section 30. Thin section photograph in transmitted light (ISPG Photo No. 1445-6).*

Figure 49. *Finely laminated dolomicrite or dololaminite of the Sombre Formation containing disharmonic folds that resemble the algal mat overfolds described by Davies (1970) from the tidal flat sequences around Shark's Bay in Western Australia. A light grey, peritidal sequence, 140 m above the base of the Sombre Formation in Section 28 (ISPG Photo No. 710-55).*

Figure 50. *Outcrop of a peritidal sequence in the Sombre Formation. Blocky, thick, grey beds pass upward into laminated beds with discontinuous, thin partings. 81 m above the base of the Sombre Formation in Section 28 (ISPG Photo No. 710-21).*

The basal part of the Sombre Formation in southern sections, such as Section 30 (Fig. 9), contains thin sand beds that probably can be correlated northward with sands in the Corridor Member of the Camsell Formation. Toward the embayment centre the Sombre Formation passes to the pink shale member of the Cadillac Formation. The detrital member of the Sombre Formation fringes the embayment and separates the main body of the Sombre Formation from the pink shale member (Fig. 11).

The Arnica Formation overlies the Sombre Formation with a conformable contact that is abrupt in the region near the Prairie Creek Embayment but more gradational and intertonguing farther east.

The Arnica-Sombre contact varies in position, from higher to lower, though a wide stratigraphic interval, reflecting pronounced variations in the relative thickness of the Sombre and Arnica formations but, as discussed previously, the thickness of the total Sombre plus Arnica interval remains relatively constant (Fig. 9). The cliff exposure shown in Figure 58 illustrates the intertonguing between the Arnica and Sombre near the type section of the Arnica Formation. In the area of the Sombre Salient, the Arnica is thin or absent as, for example, along the Arnica Range where the Sombre is conformably overlain by the Funeral Formation (Fig. 11). This also may be attributed to the facies change from Arnica to Sombre. There is no physical evidence of an erosional unconformity at the base of the Arnica Formation to support the suggestion of Douglas and Norris (1961, p. 14) that the Sombre Formation is thin in the eastern ranges of Mackenzie Mountains, and absent east of the Mackenzie Mountains, because of pre-Arnica erosion, apart from the fact that the Sombre Formation thins and disappears eastward. The preference here is to attribute the eastward disappearance of the Sombre Formation to the eastward facies change from Sombre to Arnica (Fig. 11).

Faunal evidence is also consistent with the postulated facies equivalence of the upper part of the Sombre Formation with the lower part of the Arnica Formation. This equivalence may be seen in Figure 9, where the fauna in the Sombre Formation of Section 22 is identified as late Early Devonian and, therefore, similar in age to faunas in the Arnica Formation of sections 29 and 32 for which late Early Devonian dates have been established. However, the faunal determination from the Sombre Formation indicates the presence of the conodont *dehiscens* Zone only, whereas conodont determinations from the Arnica Formation range from the *dehiscens* Zone to the slightly younger *inversus* Zone. In addition, the *dehiscens* Zone determination is from the Arnica basinal member, which is the basinward extension of the Arnica Formation beyond the shelf (Appendix 2; Fig. 9). It is possible that much of what is mapped as the basinal member of the Arnica Formation near the shelf edge may be correlative with the Sombre Formation rather than the Arnica (Fig. 2).

Apart from the equivocal evidence provided by conodonts, the occurrence of the two-holed crinoid *Gasterocoma bicaula*, in the uppermost beds of some sections of the Sombre Formation (e.g. in Sec. 30), suggests a facies relationship between the Sombre and Arnica formations since the upper part of the Arnica Formation also contains abundant two-holed crinoids. Other faunas in the Sombre Formation are sparse and poorly preserved and are commonly

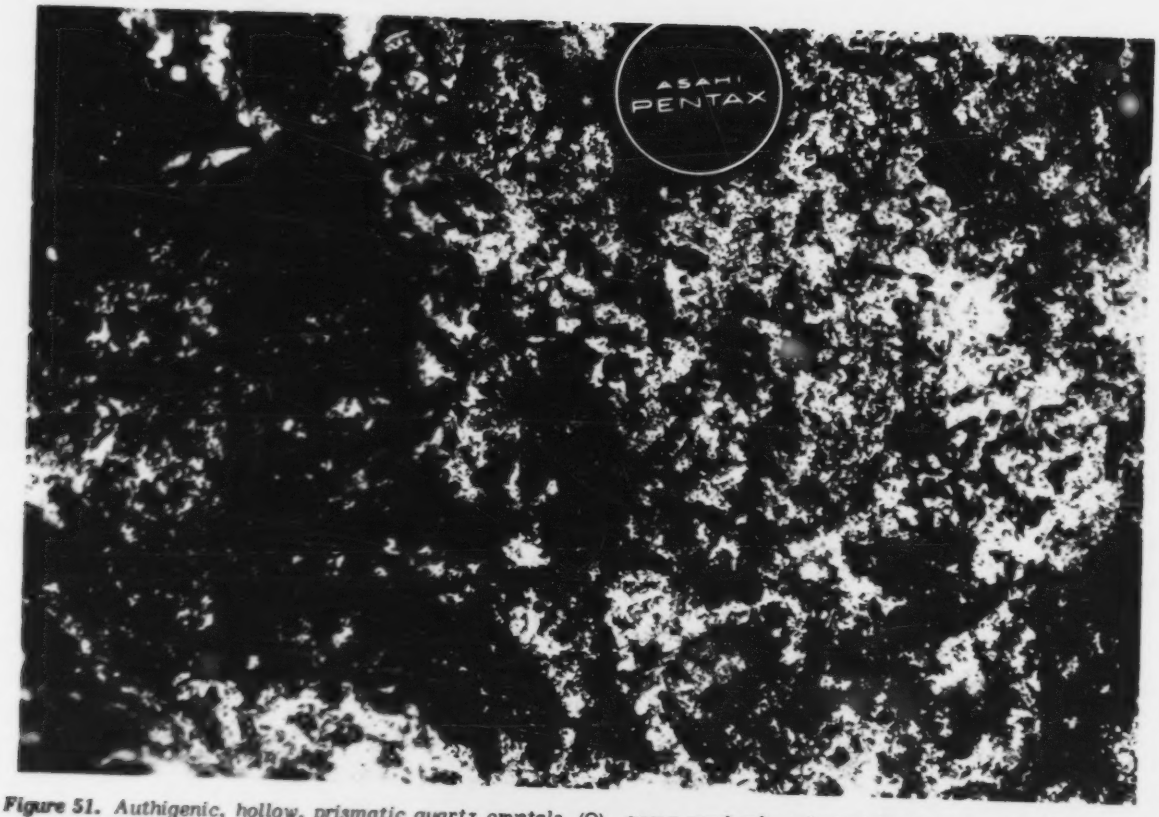


Figure 51. *Authigenic, hollow, prismatic quartz crystals (Q) occur randomly oriented in the plane of bedding in dolostone of the Arnica Formation in this bedding plane view. 82 m above the base of the Arnica Formation in Section 29. Q = quartz crystals (ISPG Photo No. 1602-1).*

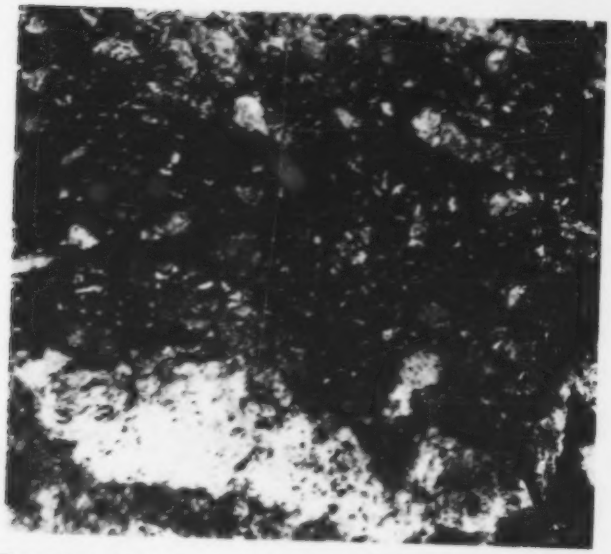


Figure 52. *Light grey, oligomictic, dolostone rubble breccia in the Sombre Formation. Very poorly sorted, angular but plastically deformed, light- and medium-grey dolomicrite clasts are floating in a medium grey, finely crystalline dolomite matrix. Possibly a type of mud-matrix debris flow deposit. 742.5 m above the base of the Sombre Formation in Section 18 (ISPG Photo No. 710-53).*

present as molds of corals, stromatoporoids and brachiopods (Fig. 47). The best preserved corals occur in the middle, dark grey, biostromal band. None of the large solitary rugose corals in this band were identified. *Amphipora* is also common in this band. Amphiporid-like remains are common in thick, subtidal, medium grey beds throughout the Sombre. Calcispheres and ostracode fragments were observed in some thin sections and are probably scattered uniformly throughout. A few of the laminated, intertidal dolostones contain recognizable, laterally linked, hemispheroidal stromatolites (e.g. unit 37 in the Sombre Formation of Sec. 30; Appendix 3).

Conodonts are present but sparse. Only one age determination could be gained from the seven Sombre samples digested for conodonts, excluding those from the Sombre detrital member. This single conodont collection, from 1871 m above the base of the Sombre Formation in Section 22 is, as previously mentioned, indicative of the *dehiscens* Zone at the Pragian-Zlichovian boundary of the Early Devonian (Appendix 2). The overall age of the Sombre Formation is probably middle Early Devonian (Pragian) to late Early Devonian (Zlichovian), based on the conodont determination and on the stratigraphic position of the Sombre between the underlying Lochkovian Vera Formation and the overlying Zlichovian to Dalejan Arnica Formation (Fig. 2).

The pink shale member of the Cadillac Formation underlies, and is the facies equivalent of much of the Sombre detrital member (Fig. 10), but the upper part of the detrital member on the west side of the embayment is correlative with the basinal member of the Arnica Formation on the east side of the embayment (Fig. 11).

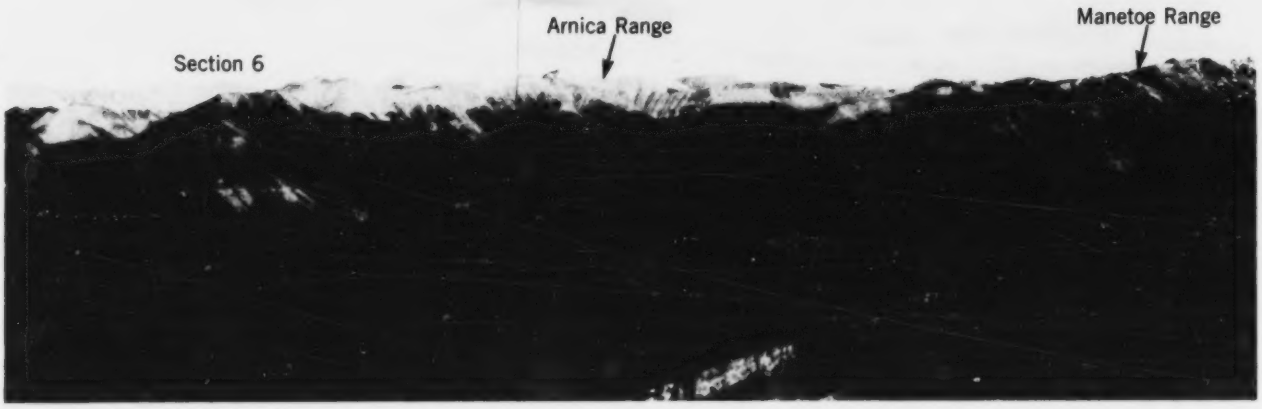


Figure 53. *A panoramic northwestward view of the lower Paleozoic shelf to basin transition in the Manetoe Range (right foreground) and in the Arnica Range (left background), showing the southward transition to the Prairie Creek Embayment. Outcrop areas of shelf carbonate are largely unvegetated, whereas areas of more terrigenous basinal rocks are heavily vegetated. Section 6 extends westward across a mountain in the foreground (slightly left of centre) (ISPG Photo No. 140-2 and 10).*

The macrofauna of the detrital member is limited and consists mainly of crinoids, including *Gasterocoma bicaula*, and brachiopod fragments. Conodonts are present and one sample, from Section 6, the reference section, yielded a conodont ozarkodinan element, similar to the Pb element of either *Pandorinellina exigua* or *P. expansa*, indicating an Early to early Middle Devonian age.

Arnica Formation

Introduction

The Arnica Formation (lmDA) is exposed widely in the Virginia Falls and Sibbeston lake map areas and has been mapped throughout the Mackenzie Mountains as far north as the Upper Ramparts River map area (106G). It has been identified north of the Mackenzie Mountains in the subsurface of Peel Plain and Peel Plateau (e.g. Aitken and Cook, 1974; Aitken et al., 1982; Pugh, 1983). The formation is not exposed south or east of the Sibbeston Lake map area but is present farther eastward in the subsurface (Law, 1971).

The name Arnica was applied by Douglas and Norris (1961, p. 14) to a sequence of conspicuously banded, dark grey dolomites that overlies the Sombre Formation. They designated a type section at First Canyon (Sec. 40) on the South Nahanni River, 61°17'N latitude and 124°14'W longitude. At this section they recorded a thickness of 1650 feet (503 m) of strata, which they described as an interbedded, colour banded sequence of dark grey, black, and brownish grey, fine grained, thick- to massive-bedded dolomite interbedded with light brownish grey, thin bedded dolomites and vuggy, porous dolomites. In this study, the measured thickness of the Arnica Formation at the type section (Fig. 47; Appendix 1) is 625.5 m (2052 ft).

The greater thickness assigned by the writers to the Arnica Formation at the type section is due, in large part, to the inclusion of some beds formerly assigned to the Manetoe Formation. A full account of the Manetoe facies dolomite and its relationship to the Arnica, Landry, Headless and Nahanni formations is discussed under a separate heading. The Arnica Formation at the type section has, therefore, been modified in this study by the inclusion of some beds from the Manetoe Formation of previous usage (Douglas and Norris, 1960, 1961).

The Arnica Formation in the Virginia Falls map area is divided into two parts; the main body of the Arnica which developed on the shelf, and a special facies of the Arnica which developed in deeper water within the Prairie Creek Embayment. This latter facies is assigned to the Arnica Formation, following Douglas and Norris (1976a), and is termed the basinal member of the Arnica Formation in this report (Fig. 81, in pocket).

Lithology, sedimentary structures, distribution, and thickness

Arnica Formation (shelf facies)

At the type section (Fig. 47) the lower two thirds of the Arnica, (about 450 m) are composed of intervals of resistant, medium brownish grey, thick bedded, sucrosic dolostone separated by more recessive, thin, light grey to white beds of laminated, very finely crystalline dolostone. This alternation imparts a prominently colour banded appearance to most of the Arnica. The dark, brownish grey beds are slightly vuggy and vaguely colour mottled, probably because of bioturbation. A few scattered corals occur in these beds and amphiporids are abundant in some beds. Small areas of possible solution-collapse crackle breccias (Fig. 47) and rubble breccias, in which the fragments are cemented by white dolomite, also occur in this part of the Arnica Formation. Stromatactis fabric occurs in some thick beds but is not common. The darker, brownish grey, thick beds grade upward into light grey, laminated dolostone and sharply overlie, (with slightly erosional contacts), light grey beds in a manner similar to that found in the subtidal/intertidal cycles in the underlying Sombre Formation. Chips eroded from the lighter grey beds are incorporated into overlying darker beds and the basal parts of many dark beds have vague ripple-shaped partings (Fig. 47).

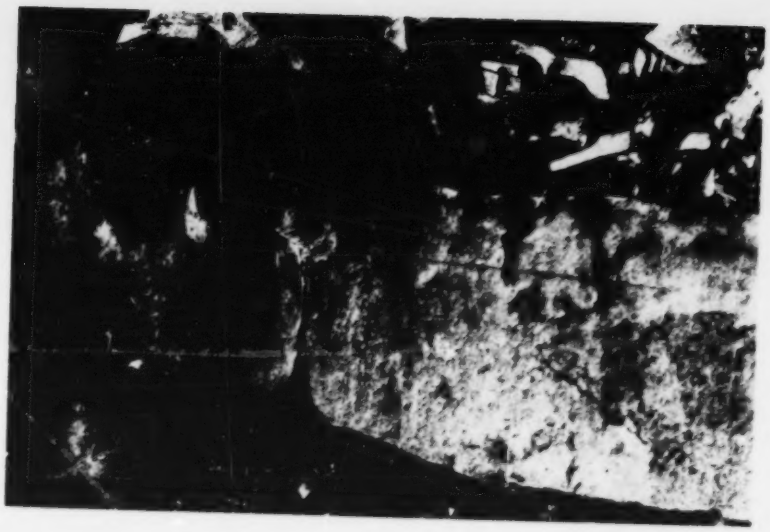


Figure 54. *Planar turbidite bed of light grey, lime packstone formed of packed millimetre-sized, ellipsoidal, rounded fragments of light- and dark-grey lime mudstone in the detrital member of the Sombre Formation. The bed shown consists of two individual flows separated by a planar contact. 221.5 m above the base of the detrital member in Section 6 (ISPG Photo No. 837-83).*

Figure 55. *A closer view of the bed shown in Figure 54. Note the slight normal size-grading of mudchips in the upper flow and the minor imbrication from left to right. This is consistent with a basinward direction of flow toward the Prairie Creek Embayment (ISPG Photo No. 837-31).*

Figure 56. *A thin section view of lime mudchips in a thin, packstone-wackestone sediment gravity flow over laminated, hemipelagic, lime mudstone; from the detrital member of the Sombre Formation. The pelletal lime mud clasts contain fenestral fabric and fragments of green algae. 146 m above the base of the Sombre Formation in Section 6 (ISPG Photo No. 1536-5).*

Figure 57. *The basal part of a light grey, crinoid and lime mudchip, grainstone-packstone sediment gravity flow deposit in the detrital member of the Sombre Formation. Large, platy clasts of the underlying dark dolostone have been reworked into the base of the flow. 147 m above the base of the Sombre Formation in Section 6 (ISPG Photo No. 837-29).*

The light grey to white, laminated dolostone intervals (Fig. 58) contain fenestral fabric and fine algal-like laminations (on a scale of one millimetre) indicating intertidal deposition. Algal mat overfolds, similar to those described in the underlying Sombre Formation, occur in these laminites. Many light grey to white intervals are grainstones formed of bleached pellets and intraclasts which are themselves formed of pellets that may have been pisolitic in part. They also contain elongate, hollow quartz crystals like those described in the intertidal laminites of the Sombre Formation (Fig. 51). These are termed needle quartz in the section descriptions (e.g. unit 5 in Sec. 40).

Above the basal, colour banded sequence is a much less strongly colour banded, 200 m thick sequence consisting of thick bedded, light to medium brownish grey dolostone that grades upward to dark and light brown-grey and grey, thick- to very thick-bedded, stromatactis-bearing and fossiliferous dolostone with brachiopods and amphiporids in some beds. Small patches of solution-collapse breccia, cemented by white, coarsely crystalline dolomite and some quartz, occur in the middle part of this unit. In the uppermost part of the Arnica Formation there are massive cavern fillings of white, coarsely crystalline dolomite belonging to the Manetoe facies dolostone.

These subdivisions of the Arnica Formation, a lower part composed of alternating, colour banded, subtidal to intertidal cycles, and an upper, stromatactis-bearing and more massive bedded part, are developed throughout the Virginia Falls map area (e.g. Sec. 29). Eastward, in the Sibbeston Lake map area the upper biostromal part is not present and the sequence in its entirety resembles the cyclic lower part of the type section as, for example, in Section 44 on the Nahanni Range, which contains nearly a complete Arnica section.

In the central and western parts of the Virginia Falls map area the Arnica Formation contains abundant crinoids including the two-holed crinoid *Gasterocoma bicaula* (e.g. Sec. 29) and is more uniformly brownish grey and less colour banded than in the type section farther east. The prominently banded basal part of the type Arnica is probably not represented in the somewhat thinner Arnica sequence adjacent to the shelf edge and bordering the Prairie Creek Embayment but, instead, passes laterally into the thick Sombre sequence near this shelf edge (Fig. 9).

The maximum observed thickness of 625.5 m occurs at the type section. Eastward and westward from the type area the Arnica becomes thinner. Information from mapping

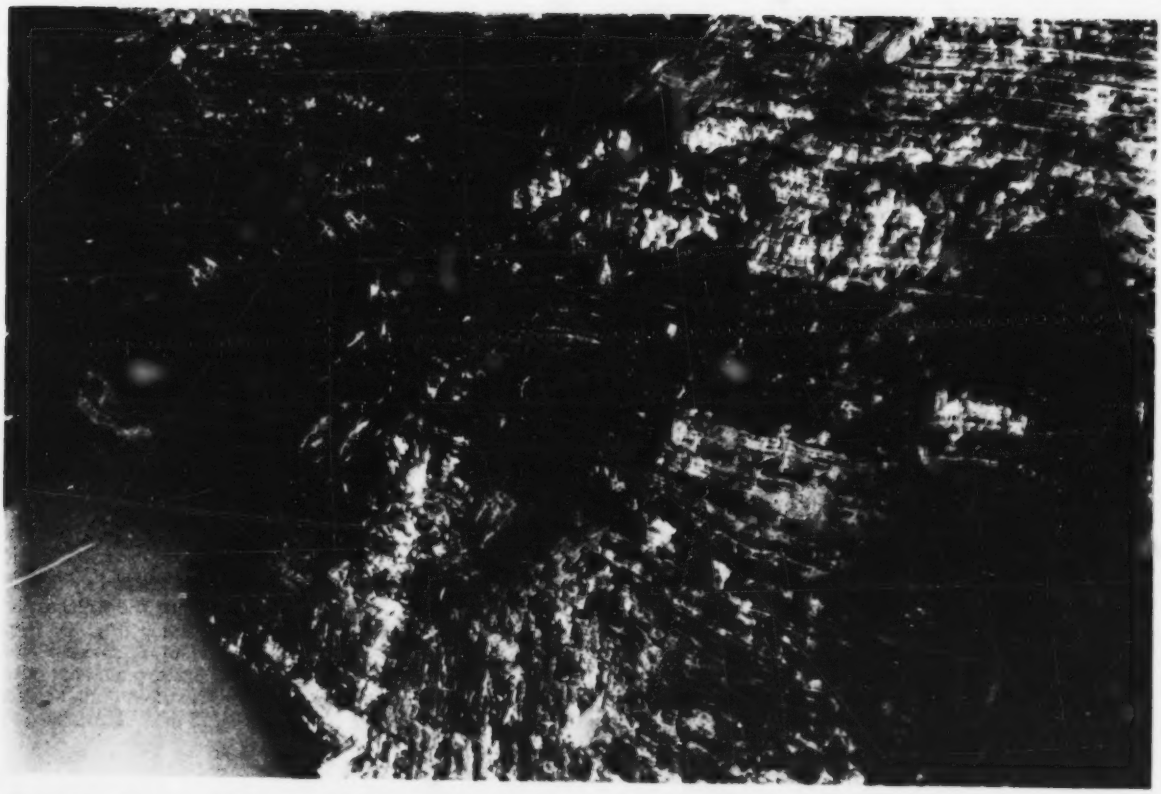


Figure 58. *This is a northeastward view of the contact between the Sombre and Arnica formations. Tongues of dark brownish grey Arnica extend farther northward (or toward the left) higher in the section, indicating that this is a facies contact rather than a strictly planar one. This cliff exposure is at First Canyon, immediately east of Section 40 on the South Nahanni River. Symbols as on Figure 81 (legend) (ISPG Photo No. 710-41).*

indicates that the Arnica thins toward the shelf edge around the Prairie Creek Embayment (Fig. 11).

The Arnica is absent along most of the Manetoe Range on Sombre Salient but is present farther west on the salient in the area around Section 1 (Fig. 11). On the east side of the embayment it is absent along part of the Headless Range and along part of an unnamed range south of the South Nahanni River and west of the Headless Range (Fig. 81, in pocket).

Basinal member

The basinal member of the Arnica Formation (lmDAb) is exposed throughout the Prairie Creek Embayment and is the basinward extension of the Arnica Formation into the embayment (Fig. 81, in pocket). The Arnica basinal member is a prominent, dark grey weathering, resistant map unit easily distinguished from the more recessive underlying Cadillac Formation and from the overlying recessive, buff weathering Funeral Formation.

Section 13, at 61°28'N latitude and 124°50'W longitude, is one of the better exposed sections of the basinal member and may be regarded as a good reference section for this member. In this section, cherty or silicified dolostone in the lower part of the section grades upward to limestone (Appendix 1). The dolostone in the lower part is a dark grey to brownish grey, slightly argillaceous, dolomitized, laminated wackestone similar to that shown in Figure 59. In some places these dolostones have a faint pink tint. Bands of dark grey chert nodules and grey silicification occur parallel to bedding (Fig. 13). In the basal unit (unit 6) of Section 13, laminated dolostone beds about 25 cm thick have detached to form upright folds that are cored with brecciated dolostone laminite fragments cemented by white dolomite (Fig. 59). The basal unit (unit 2) of the basinal member in Section 15 contains thick breccia beds of angular, tabular dolostone clasts cemented by white dolomite (figs. 60, 61). Dolostone laminites immediately under these breccia beds contain sheet cracks that are filled with dark grey, geopetal carbonate sediment and white dolomite cement (Fig. 60). Probably both the detached laminite sequences and the breccia beds represent synsedimentary slump deposits, some of which developed into debris flows. Beds underlying debris flows may have been cracked because of the stresses induced in these beds during the passage of debris flows over them. Because of the lack of fine grained matrix material in these breccias, and their clast-supported fabric, they might be more properly regarded as grain flow deposits (Cook et al., 1972).

Figure 59. *An upright slump fold in the basinal member of the Arnica Formation. This is interpreted to be a synsedimentary slump fold that underwent brittle deformation during slumping because of synsedimentary cementation. White, coarsely crystalline dolomite fills interfragment spaces. Nine metres above the base of the Arnica Formation in Section 13 (ISPG Photo No. 1602-2).*

The white dolomite cement between the clasts in the breccia bed from Section 15 may be differentiated into two phases. Each breccia clast is surrounded by a one millimetre thick isopachous crust of translucent, bladed, finely to medium crystalline dolomite whereas the remaining interfragment cement is coarsely crystalline, opaque and predominantly euhedral dolomite (Fig. 61). One explanation for this style of dolomitization is that the thin, isopachous dolomite crust is a replacement of a pre-existing crust of syndepositional, high-magnesian calcite, submarine cement, similar to those documented in many modern and ancient settings (Bricker, 1971).

The upper part of the basinal member is a mixture of limestone and dolostone with limestone being more abundant higher in the sequence. Most of the limestone is thin bedded, dark grey laminated lime mudstone, but some coarsely fragmental, fossiliferous (crinoid, coral and brachiopod fragments) and intraclast-bearing wackestone debris flow and turbidite deposits (figs. 62, 63) are scattered throughout. These sediment gravity flow deposits range from 10 to 50 cm thick, with the thicker deposits containing coarser fragments. Thinner flows exhibit a slight degree of normal grading and were perhaps turbidites whereas the thicker flows exhibit the unsorted and ungraded fabric typical of debris flows. Some fragments are up to 20 cm long and are typically subrounded and oriented parallel to bedding (Fig. 62). The tabular aspect of the clasts themselves suggests that they were derived from the breakup of thin beds, like those in the basinal member, rather than from the thick beds that are typical of the Arnica Formation around the embayment. White, dolomitized, crinoid packstone sediment gravity flow deposits (grain flows?) in thin beds also occur in the upper part of the basinal member in some sections (e.g. unit 4 in Sec. 15). Dolostone in the upper part of the basinal member is similar to that described in the lower part but most of the upper part is partly silicified.

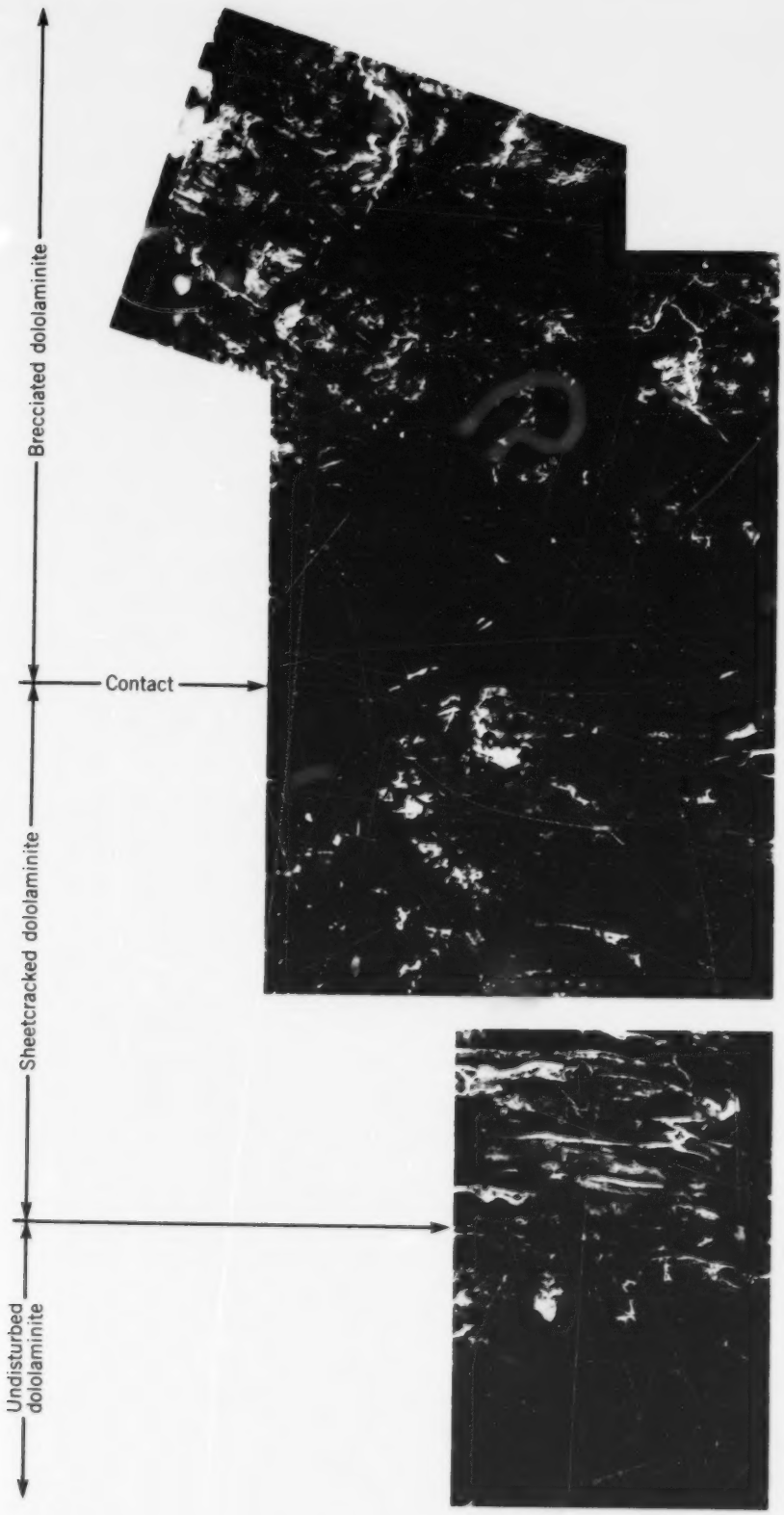
The basinal member ranges in thickness from about 90 m up to 350 m in 3 complete and 2 incomplete sections. Probably 150 m is a representative thickness for the basinal member throughout most of the embayment area.

The sequence of debris flows exposed at Section 14 is included here in the basinal member of the Arnica Formation (Appendix 3) for the purpose of mapping (Fig. 81, in pocket). This section, which may be typical of Zlichovian to Dalejan aged, Arnica equivalent, slope to basin sediments outside the embayment, exhibits some features that are not characteristic of the Arnica basinal member developed within the embayment.

The large megabreccia flows exposed in this canyon section, near Second Canyon of the South Nahanni River, include some very large blocks that are many metres across (figs. 64, 65). The large debris flow deposits at Section 14 pass laterally westward, in a distance of 1 to 5 km, into black and dark grey, argillaceous limestones and dolostones of the Road River Formation. These deposits are similar to the megabreccia sheets described by Cook et al. (1972) from the margin of the Devonian Miette Reef in Alberta. Both the Miette megabreccia sheets and the megabreccia bodies at Section 14 have planar bases and hummocky tops (Fig. 65) and occur for about 1 to 5 km basinward from the shelf edge. The hummocky tops of many megabreccia sheets in both of these areas are caused by the protrusion of the larger carbonate blocks metres above the main body of the flows, although the tops of some debris flows in Section 14 are simply undulose or wave-like (Fig. 65). It is not possible to determine the lateral extent of megabreccia bodies at Section 14 because of lack of exposure, but it seems likely that they are sheet-like rather than linear or elongate because of the absence of channeling at the bases of these deposits. The matrix and the blocks of these deposits are abundantly crinoidal and coarser crinoid ossicles up to 5 cm across predominate in the thicker flow deposits (see description of Sec. 14; Appendix 3).

Contact relationships, age, correlation and faunas

The conformable, diachronous facies contact between the Arnica and the underlying Sombre Formation has been described in the discussion on contact relationships of the Sombre Formation. Many of the light grey to white bands in the lower part of the Arnica are lateral extensions of



intertidal beds of the Sombre Formation (Fig. 58). East of the Virginia Falls map area, the Arnica Formation conformably overlies the 'Silurian-Devonian undivided' sequence exposed along the Nahanni Range (Fig. 11). The Arnica Formation in the shelf sequence passes laterally into the basinal member of the Arnica Formation (Fig. 11). The entire Arnica Formation, in both the shelf and embayment sequences, passes south and west into the shales and argillaceous limestones of the Road River Formation, which fills the Meilleur River Embayment in the southwest part of the Virginia Falls map area. Poorly preserved corals, such as *Alveolites* sp. and *Thamnopora* sp.; crinoids, such as *Gasterocoma bicaula*; brachiopods and amphiporids are common in the Arnica Formation (Fig. 47; Appendix 3). Stromatoporoids may occur in the more fossiliferous upper part of the Arnica previously assigned to the Manetoe Formation. Conodonts from the main body of the Arnica in the shelf sequence include *Icriodus culicellus*, *Pandorinellina exigua exigua*, and *Polygnathus inversus* which indicate a Zlichovian to Dalejan, late Early Devonian age for the Arnica Formation (Fig. 2) in agreement with Chatterton (1978).

The Arnica basinal member is the lateral equivalent of the Arnica Formation on the east side of the embayment and of the upper part of the Sombre Formation (including the detrital member) on the west side (Fig. 11). It overlies the pink shale member in the central part of the embayment and it is thought to overlie the detrital member of the Sombre Formation locally in the eastern part (Fig. 11). Conodont and macrofaunal determinations from the basinal member indicate that it ranges in age from uppermost Pragian to Zlichovian. These faunas include the conodont *Pandorinellina exigua philipi* and the crinoid *Gasterocoma bicaula* (Appendix 2).

Figure 60. *This outcrop shows a debris flow in the basinal member of the Arnica Formation. A chaotic, packed breccia of tabular, dark brownish grey, dolostone laminite clasts (a grain flow deposit?) sharply overlies thin bedded, dark brownish grey (hemipelagic?), dolostone laminite. Sheet cracks in the underlying beds are filled with dark grey, geopetal sediment and white dolomite cement. 82.5 m above the base of the Arnica Formation in Section 15 (ISPG Photo No. 837-65, 66 and 67).*

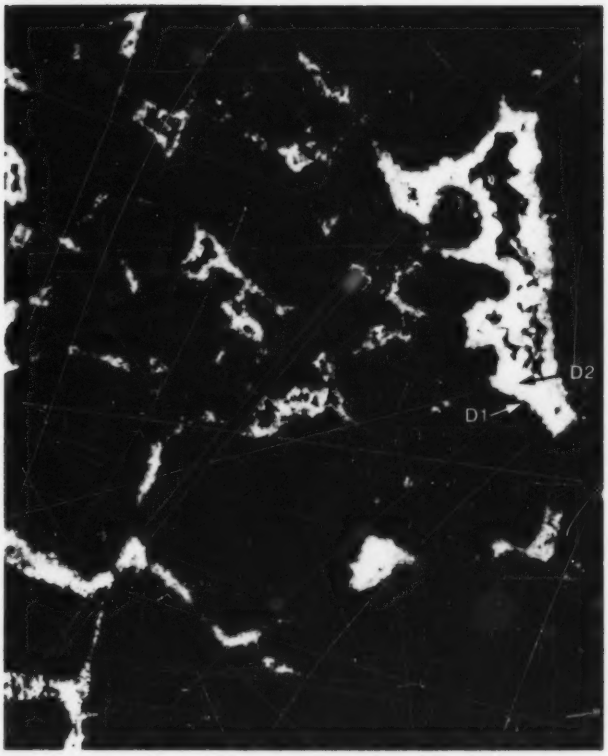


Figure 61. *A closer view of a polished sample of the breccia shown in Figure 60. The white dolomite cement between the clasts may be differentiated into two parts, a translucent palisade of finely crystalline, bladed dolomite, 1-2 mm thick, that forms an isopachous coating around the clasts (D1) and the main cavity filling of euhedral, opaque, white dolomite (D2) (ISPG Photo No. 1445-29).*

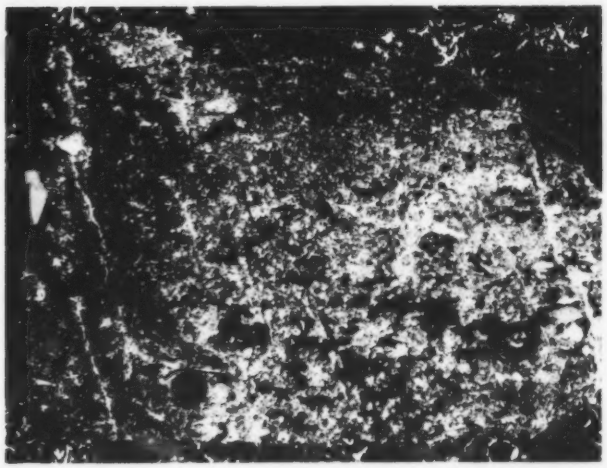


Figure 62. *A loose block of crinoid intraclast rudstone, from a debris flow deposit, containing platy fragments and angular chips of dark grey dolostone laminite oriented parallel to bedding. From the basinal member of the Arnica Formation. 330 m above the base of the Arnica Formation in Section 11 (ISPG Photo No. 837-71).*

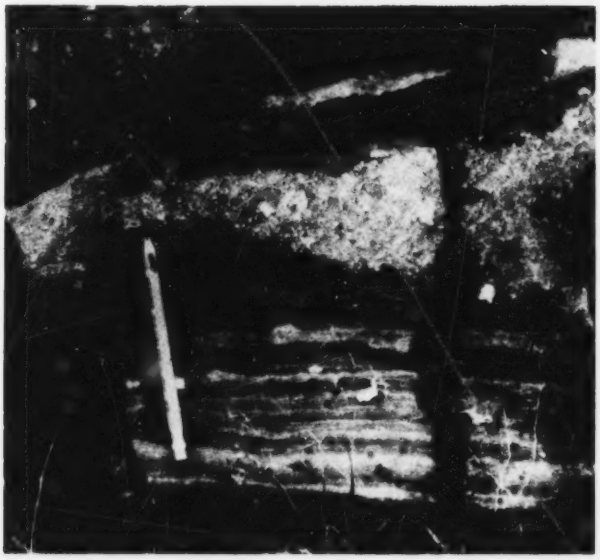


Figure 63. *The possible distal end, or nose, of a crinoidal debris flow in dark, hemipelagic dololaminite of the basinal member of the Arnica Formation. Thin, light coloured laminae have relatively flat bases and undulating upper surfaces, and may represent thin turbidites. 89 m above the base of the Arnica Formation in Section 13 (ISPG Photo No. 710-3).*

Figure 64. *A distant, northward view of the transition between the debris flow tongues of the detrital member of the Sombre Formation on the right and the Road River Formation shales on the left. This cliff exposure, on the north side of the South Nahanni River, is more than 300 m high. The projecting nose of the ridge is the line of Section 14 (ISPG Photo No. 710-46).*

Figure 65. *A closer view of some of the megabreccia debris flows shown in Figure 64. The large flow in the centre appears to have a broadly channelled base and a hummocky but broadly level upper surface. Some large, stranded blocks, more than 5 m across, may be seen in the lower part of the exposure. Overlying beds drape over these blocks (ISPG Photo No. 837-43).*

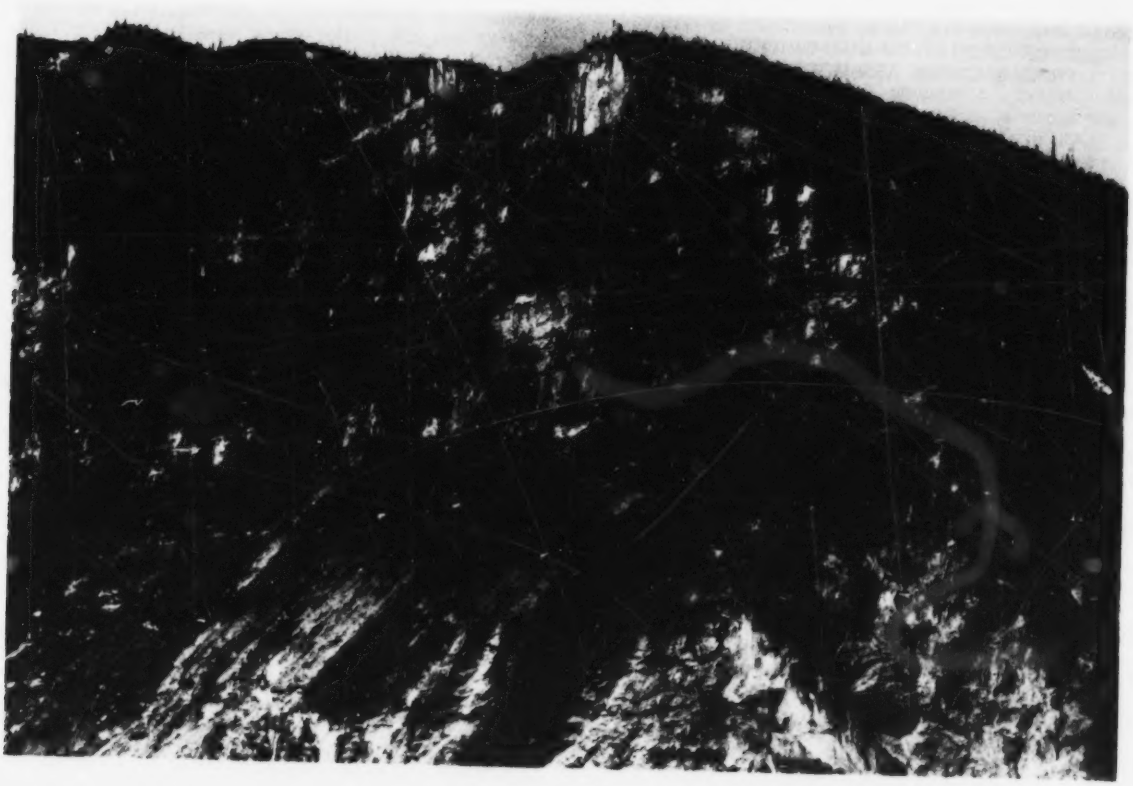


Figure 64

Figure 65

DEPOSITIONAL AND TECTONIC SUMMARY OF THE UPPER CADILLAC PHASE OF THE PRAIRIE CREEK ASSEMBLAGE

Sedimentation in the Upper Cadillac phase was dominated by the Prairie Creek Embayment, which came into existence during deposition of the Lower Cadillac phase and coincided with the period of the Early to Middle Devonian rise in sea level (Fig. 20). The configuration of the embayment remained the same throughout deposition of the Upper Cadillac phase (Fig. 23) and was similar to that during the Lower Cadillac phase (Fig. 22). However, silt and sand did not move across the shelf into the embayment and the supply of terrigenous material to the embayment was drastically reduced during deposition of the Upper Cadillac phase, because the embayment was surrounded by the shallow water peritidal carbonates of the Sombre and Arnica formations.

The combined thickness of the units that fill the embayment (the pink shale member of the Cadillac, the detrital member of the Sombre, and the basinal member of the Arnica), is greater near the edge of the embayment and thinner toward the embayment centre, ranging in thickness from 706 m in Section 5 to slightly more than 135 m in Section 10. This reflects the dominantly centripetal style of sedimentation in Prairie Creek Embayment during deposition of the Upper Cadillac phase (Fig. 66). Carbonate sediments generated in relatively large volumes at the shelf edge were transported toward the embayment centre by sediment gravity flows. This is particularly true for the detrital member of the Sombre Formation, which consists largely of planar turbidites composed of shallow water carbonate mudchips. The faintly laminated lime mudstone beds in the pink shale member probably represent the basinward extension of the coarser grained turbidites of the Sombre detrital member. The platy, pink weathering, silty lime mudstone beds between these transported carbonates may represent a largely pelagic component of deposition that was uniform throughout the embayment. The lack of erosional features within pink bed sequences supports this interpretation. In contrast, erosional features commonly occur at the bases of grey, lime wackestone or mudstone beds.

The pink colouration in these basinal beds may be the consequence of the development of an oligotrophic depositional environment in the embayment, which occurs in environments where there was insufficient organic material to reduce the avaiable iron to the ferrous state, so that even the small amount of available iron remains totally in the oxidized form (Franke and Paul, 1980). Certainly, biogenic material is notably absent in the embayment-filling sediments of the Upper Cadillac phase compared to that in the sediments of the Lower Cadillac phase. This could have been due to a slower rate of interchange of the bottom layers of embayment water with nutrient-laden, deeper, more open ocean water in the Selwyn Basin when the embayment was fully formed. A dearth of nutrients may have inhibited the growth of organisms in the embayment, so that little organic material was generated and reducing or euxenic conditions could not develop to the degree necessary to reduce the available iron from its oxidized state.

The resedimented carbonates in the embayment probably were derived from a coexisting marine sand belt at the shelf edge of the embayment (Fig. 66). Most of this marine sand belt had been eroded or is buried beneath the Manetoe and Tundra thrust plates, but some of this belt is preserved in some shelf edge areas on the east side of Prairie Creek. This marine sand belt is analogous in its shelf edge position to the marine sand belt rimming the Bahama Banks (Ball, 1967), but is composed of lime mudchips, largely

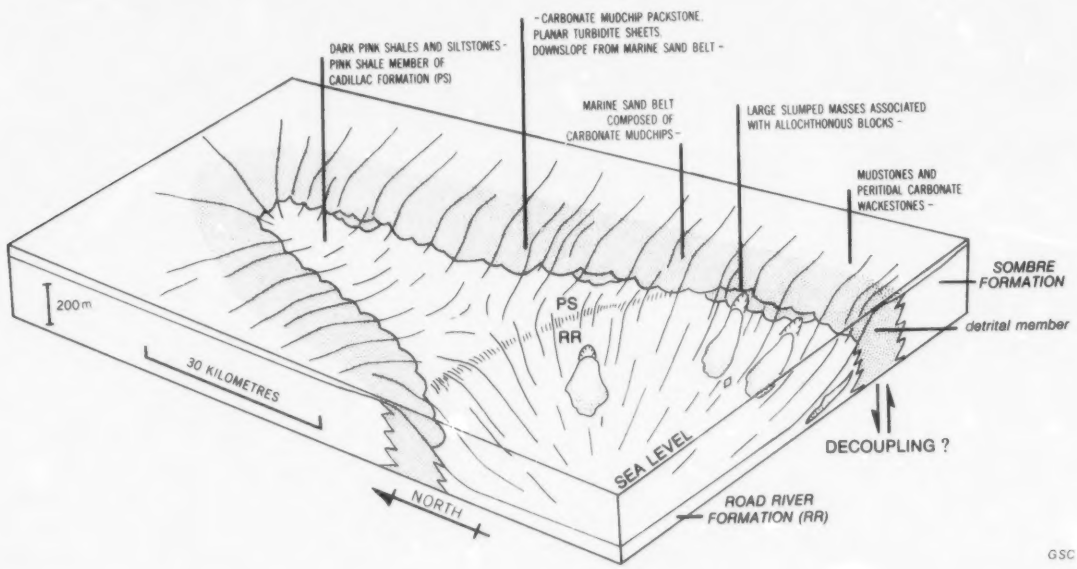

- CARBONATE MUDCHIP PACKSTONE. PLANAR TURBIDITE SHEETS. DOWNSLOPE FROM MARINE SAND BELT -
DARK PINK SHALES AND SILTSTONES - PINK SHALE MEMBER OF CADILLAC FORMATION (PS)
MARINE SAND BELT COMPOSED OF CARBONATE MUDCHIPS -
LARGE SLUMPED MASSES ASSOCIATED WITH ALLOCHTHONOUS BLOCKS -
MUDSTONES AND PERITIDAL CARBONATE WACKESTONES -
SOMBRE FORMATION
detrital member
200 m
30 KILOMETRES
PS
RR
SEA LEVEL
DECOUPLING ?
NORTH
ROAD RIVER FORMATION (RR)
GSC

Figure 66. *A schematic block diagram of the Prairie Creek Embayment during deposition of the hemipelagic pink shale member and the detrital member. The detrital member of the Sombre Formation is formed largely of lime mudchip-bearing turbidites derived from a mainly inferred, shelf edge, marine, mudchip-sand belt. Outside the main body of the embayment the shelf to slope transition was probably more abrupt as the Sombre Formation passes directly into the Road River. In this type of shelf-to-slope transition, coarsely fragmental megabreccia flows and large stranded blocks are common.*

derived from tidal flats, rather than the coated botryoidal grains and grapestone aggregates that form the carbonate sediments in the Bahama sand belt. These lime mudchips formed the loose sediment in the sediment gravity flows of the Sombre detrital member (Fig. 66) The absence of oolitic coatings on these mudchips may be consistent with the stagnation of water in the embayment inferred to have caused oligotrophy. The precipitation of $CaCO_3$ on tidal flats surrounding the embayment may have lowered the concentration of calcium ions in the embayment waters, because of the slow interchange of these waters with open marine water of the Selwyn Basin.

Sediment gravity flows in the detrital member may have been initiated by depositional oversteepening at the shelf edge and triggered by storms. Seismic activity, which was inferred to have caused the development of extensive breccia bodies in the peritidal shelf sediments of the Sombre Formation, also may have initiated some of these sediment gravity flows.

South of the embayment, the Sombre and Arnica formations pass abruptly into the Road River Formation. The intervening slope deposits are coarsely fragmental debris flows rather than the finer grained turbidites present in the embayment. This may indicate that the shelf edge slope was steeper outside the embayment than within the embayment. However, analogous debris flows at the edge of the Devonian Miette carbonate complex were initiated on shallow slopes of less than five degrees (Cook et al., 1972). Possibly the more open marine conditions of the shelf edge outside the embayment were conducive to more rapid submarine cementation of their shelf edge sediments. Earthquakes could have fractured and mobilized these cemented sediments into blocky debris flows at the shelf edge, whereas the uncemented, loose sand sized material in the embayment would merely form planar turbidites, indistinguishable in outcrop from those that were triggered by storm activity.

Deposition of the Sombre Formation extended landward tens of kilometres from the shelf edge up to where the Sombre passes laterally to the banded lower part of the Arnica. One interpretation of this disposition of facies is that the dark brownish grey Arnica sediments may have accumulated in a relatively quiet water lagoonal region landward of a more emergent area or belt of peritidal, carbonate mud mound deposition represented by the lighter grey Sombre sediments. The broad area of Sombre shoal deposition absorbed the wave and current energy impinging on it from the open 'Road River' sea to the west, particularly at the extreme shelf edge where the sand-sized sediments of the Sombre detrital member accumulated. The combination of wave and current energy, and the relatively large amount of subaerial exposure, caused the noncalcareous organic material in the Sombre sediments to be bleached penecontemporaneously with deposition, whereas the darker Arnica sediments remained unbleached in the quieter, protected shelf lagoon behind the Sombre shoal area.

The area of Arnica deposition spread at the expense of Sombre deposition until most of the shelf was blanketed by dark brownish grey, subtidal Arnica sediments. Unlike the lower banded part, the laterally more extensive upper part of the Arnica is uniformly subtidal with abundant crinoids. At the top of the Arnica, thick bedded biostromal rocks containing corals and abundant stromatactis probably signify more open marine conditions following the disappearance of the Sombre shoal area. These uppermost biostromal beds, as previously discussed, were formerly included in the Manetoe Formation of Douglas and Norris (1961, 1976a).

Rapid carbonate production at the shelf edge probably slowed considerably when the edge was completely submerged during Arnica deposition. This submergence terminated the rapid supply of shelf edge generated, sand sized, detrital carbonate fragments, and the region around the embayment became an area of increased biological activity, as evidenced by the abundance of crinoidal sediments in the Arnica on the shelf.

The embayment-filling sediments reflected these changes in shelf sedimentation, and the basinal Arnica sediments were hemipelagic, fine grained, dark laminated carbonate muds containing occasional crinoid debris flows. The dark colouration of these sediments was caused by the the presence of organic material, and by the reduction of iron to form pyrite, which the organic material promoted.

The Prairie Creek Embayment appears to have been similar in its geometry and bathymetric setting to the modern day platform edge embayment of Exuma Sound on the Great Bahama Bank. Like Prairie Creek Embayment, Exuma Sound is an elongate, spoon-shaped depression that is open at one end to the open ocean and contains extensive fine grained turbidite and debris flow sheets (Crevello and Schlager, 1980). The Prairie Creek Embayment appears to have been smaller and perhaps was not as deep as Exuma Sound (800-900 m). The stratigraphic relief on the top of the Arnica Formation, between the embayment centre and the shelf edge, suggests a paleodepth of about 500 m in the centre of the Prairie Creek Embayment (Fig. 11).

CHAPTER IV

THE FUNERAL-HEADLESS ASSEMBLAGE

Introduction

This Middle Devonian sequence or assemblage includes the Landry, Funeral, Headless and Nahanni formations. It is much thinner than the underlying Prairie Creek assemblage and is almost entirely Couvinian (Eifelian) in age, with only a few uppermost beds of the assemblage being earliest Givetian. The Funeral-Headless assemblage is widely exposed in the Virginia Falls and Sibbeston Lake map areas, but the exposure is of variable quality because the more argillaceous parts are covered with vegetation and, also, because the soft, incompetent, thin bedded, shaly limestones of the Funeral and Headless formations rarely form continuous solid outcrop.

During deposition of the lower part of this assemblage the Prairie Creek Embayment disappeared and Root Basin was re-established briefly as a bathymetric feature. Deposition of the upper part of the Funeral-Headless assemblage was marked by the disappearance of Root Basin as a bathymetric feature and the advent of a simple, approximately linear, west-facing shelf to slope transition. This change from a paleogeography dominated by the Prairie Creek Embayment to a simple west-facing slope occurred in two distinct stages or phases; the Funeral-Landry phase and the overlying Headless-Nahanni phase.

Large areas on the shelf subsided after deposition of the Prairie Creek assemblage and shaly limestones and dolostones of the Funeral Formation were deposited below wave base on these areas during deposition of the Funeral-Landry phase, so that the Funeral Formation outcrops extensively in the region of Root Basin in the Virginia Falls and Root River map areas (Douglas and Norris, 1976a, 1976c). This large, poorly defined re-entrant or intra-shelf basin in the carbonate shelf edge is defined also by the basinward depositional limit of the Landry Formation. Part of the Sombre Salient remained as a paleogeographic feature during deposition of this phase. This re-entrant disappeared during deposition of the overlying Headless-Nahanni phase, and the carbonate shelf edge, defined by the depositional edge of the Nahanni Formation, became approximately linear (Fig. 67).

Rapid subsidence of the carbonate shelf together with a rise in sea level following deposition of the Headless-Nahanni phase, was followed by the accumulation of a thick, Late Devonian shale sequence composed of the Besa River, Horn River and Fort Simpson formations above the entire lower Paleozoic carbonate shelf sequence in the Mackenzie Arch. This marked the end of early Paleozoic carbonate deposition in the region of the Mackenzie Mountains.

THE FUNERAL-LANDRY PHASE

Landry Formation

Introduction

The term Landry Formation (mDL) was proposed by Douglas and Norris (1961, p. 18) "for the grey weathering thick- to massive-bedded limestones" (Douglas and Norris, *ibid.*) that overlie dolostones of the Arnica Formation and are overlain by the argillaceous limestones of the Headless Formation. They designated the section along Pastel Creek in the Delorme Range of the Root River map area (Douglas and Norris, 1976c) as the type section of the Landry Formation. The Landry Formation is 300 feet (91.5 m) thick in this section.

Douglas and Norris (1961, 1976a) did not recognize the Landry Formation in the Virginia Falls map area. In places they mapped the Manetoe Formation in the equivalent stratigraphic position between the Arnica and Headless formations. However, the Landry Formation was identified and mapped by the writers in the Virginia Falls map area (Fig. 81, in pocket). The report area marks the southern limit of the exposed Landry, although it may extend a short distance farther south in the subsurface toward 60°N latitude. Northward, the Landry Formation extends throughout a large part of the Mackenzie Arch and, recently, has been mapped still farther north in the subsurface east of the Richardson Mountains (Pugh, 1983). Instead of the Landry Formation, the laterally equivalent Funeral Formation is developed in the region of Root Basin and on the west side of Redstone Arch facing the Selwyn Basin.

In the Virginia Falls map area, the Landry is a distinctively bluish grey, resistant, cliff-forming map unit that stands out in many places as a series of thick, resistant beds, separated by recessive thinner bedded intervals, above more homogeneously weathered, brownish grey Arnica dolostones. The relationship between the Landry and the underlying Arnica Formation in the Virginia Falls map area is obscured by the widespread development of the Manetoe facies dolomite in both the Landry and Arnica formations. The top of the Landry is well defined by the very recessive overlying argillaceous limestones of the Headless Formation in the western part of the Virginia Falls map area, but, farther east, where the Headless Formation is thinner and less argillaceous, the identification of the Landry beneath a rather homogeneous Headless-Nahanni interval is more difficult.

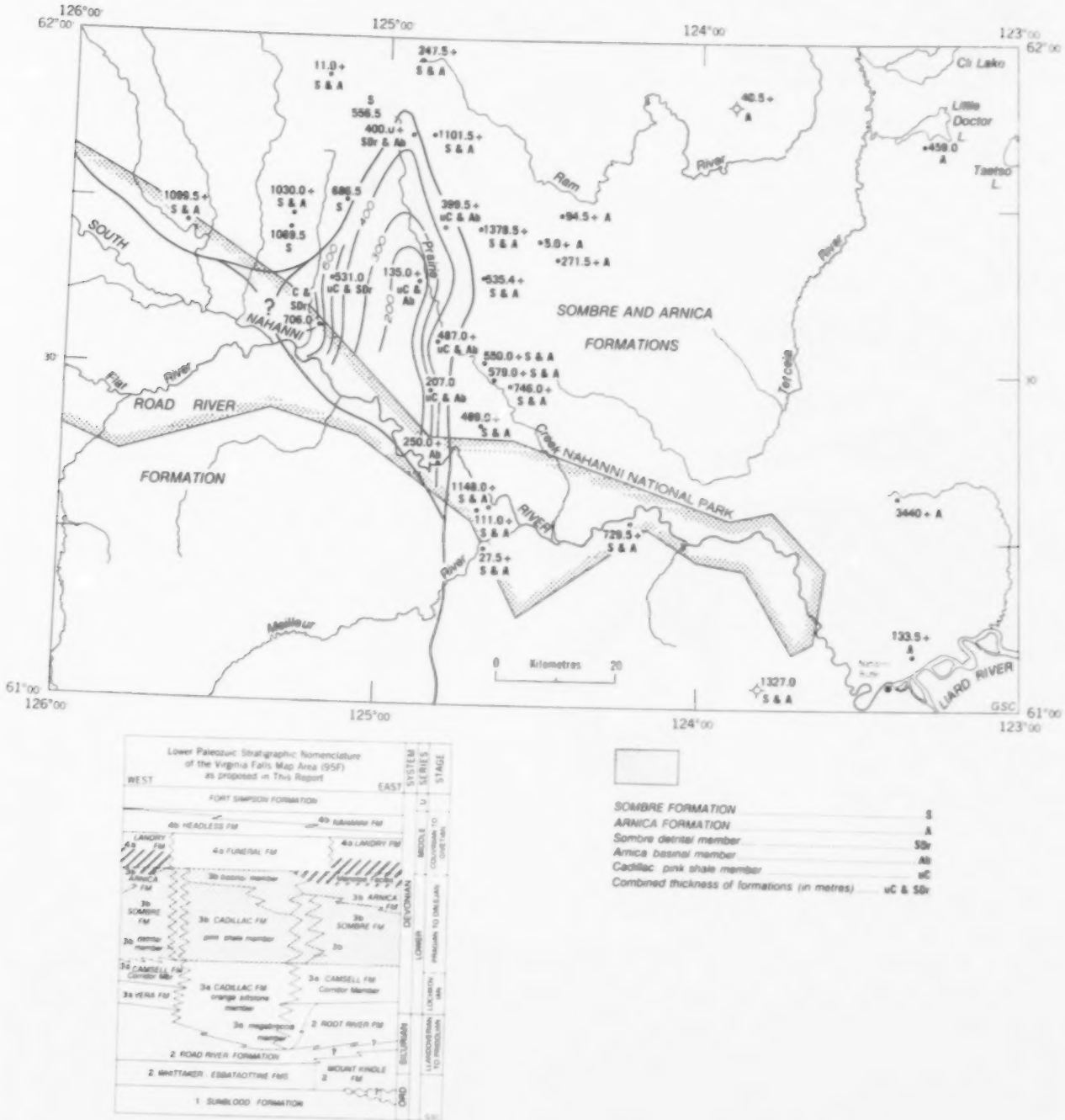


Figure 67. *A paleogeographic map showing the configuration of the Landry shelf edge and thicknesses of the Landry and Funeral formations (in metres). Large parts of the Prairie Creek Embayment were submerged during deposition of the Funeral-Landry phase as the Root Basin was reactivated and Funeral shale accumulated on former shelf areas that bordered the embayment. Also shown is the western limit of the Nahanni Formation. The Headless Formation continues westward but eventually merges with shales of the Besa River Formation.*

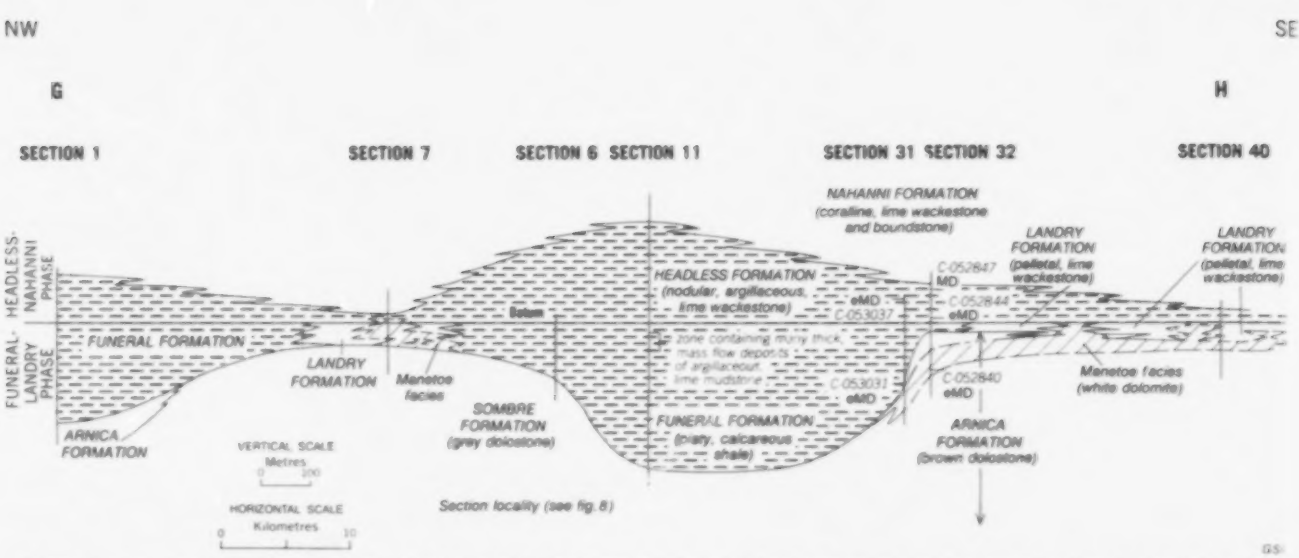


Figure 68. *A stratigraphic cross-section of the Middle Devonian Funeral-Headless assemblage along the line of section G-H in Figure 8, in the central part of Virginia Falls map area. The Landry Formation is interpreted to be the entire shelf equivalent of the Funeral Formation shales. The Manetoe facies dolomite includes parts of the Arnica, Landry and Headless formations.*

Lithology, sedimentary structures, distribution, and thickness

In the report area the Landry Formation is light to medium bluish grey or grey weathering, medium to thick bedded, light to dark brown (tan), pelletal packstone, grainstone and wackestone (Fig. 47). Bedding is commonly smooth, continuous, and planar, with thick to medium beds separated by thin recessive intervals of thinner bedded, dark grey, slightly argillaceous and bituminous wackestone. A faint ochre coloured staining occurs between some Landry beds, particularly in the western part of the Virginia Falls map area. In some places, such as in unit 13 of Section 39, large channel deposits up to 10 m wide and several metres deep are visible. These channels are filled with rippled pelletal and intraclast wackestone.

The Landry occupying the shelf part of the eastern side of the Virginia Falls map area ranges from about 30 m to 100 m thick. The remaining Landry along the Sombre Salient on the west side of the map area is more than 180 m thick in places (such as Sec. 8).

Contact relationships, age, correlation, and faunas

The Landry rests abruptly but conformably on the Arnica in the eastern part of the Virginia Falls map area, (as in Sec. 39) in those places where this contact has not been obscured by development of the Manetoe facies. It is not possible to ascertain the degree of intertonguing, if any, between the Landry and Arnica formations in this area, but farther north there are places where these two units are interbedded (Douglas and Norris, 1963, p. 18; Douglas, 1976). The Arnica Formation is absent along parts of the Sombre Salient and in these areas the Landry conformably overlies the Sombre Formation (Fig. 68). The argillaceous and fossiliferous lime wackestones of the Headless Formation overlie the Landry Formation with an abrupt but conformable contact (Fig. 68). In areas where the shelf-to-basin transition is exposed, such as at Ram Plateau, the Landry and its accompanying Manetoe facies dolomite pass very abruptly to shaly limestones of the Funeral Formation (Fig. 69). In some places (as in Sec. 11), the upper part of the Landry may extend basinward over part of the Funeral Formation. This disposition of facies, with Landry limestones extending farther basinward higher in the sequence has been noted also in the Root River map area by Douglas and Norris (1961, p. 16-17; 1976c).

The Landry is very sparsely fossiliferous and commonly contains only a few ostracodes and calcispheres, except in the regions of the Sombre Salient and Ram Plateau where crinoid fragments and a few poorly preserved corals are present. No Landry faunas were identified precisely but the Landry Formation must be of Dalejan to Couvinian age, based on its stratigraphic position between the Dalejan aged Arnica Formation and the Couvinian aged Headless Formation. This is in agreement with the age of the Landry farther northwest reported by Gabrielse et al. (1973) and Chatterton (1978). In the Meilleur Creek Section, the Headless appears to rest directly on the Manetoe facies of the Arnica Formation, a situation that is anomalous with respect to the remainder of the Virginia Falls map area where either the Landry or the Funeral formations are present beneath the Headless. It is likely that a thin, unexpected Funeral interval exists at the base of this Headless interval in a manner similar to the thin Funeral interval exposed at Second Canyon (Sec. 32) or, less likely, an unconformity of very local extent is developed here.

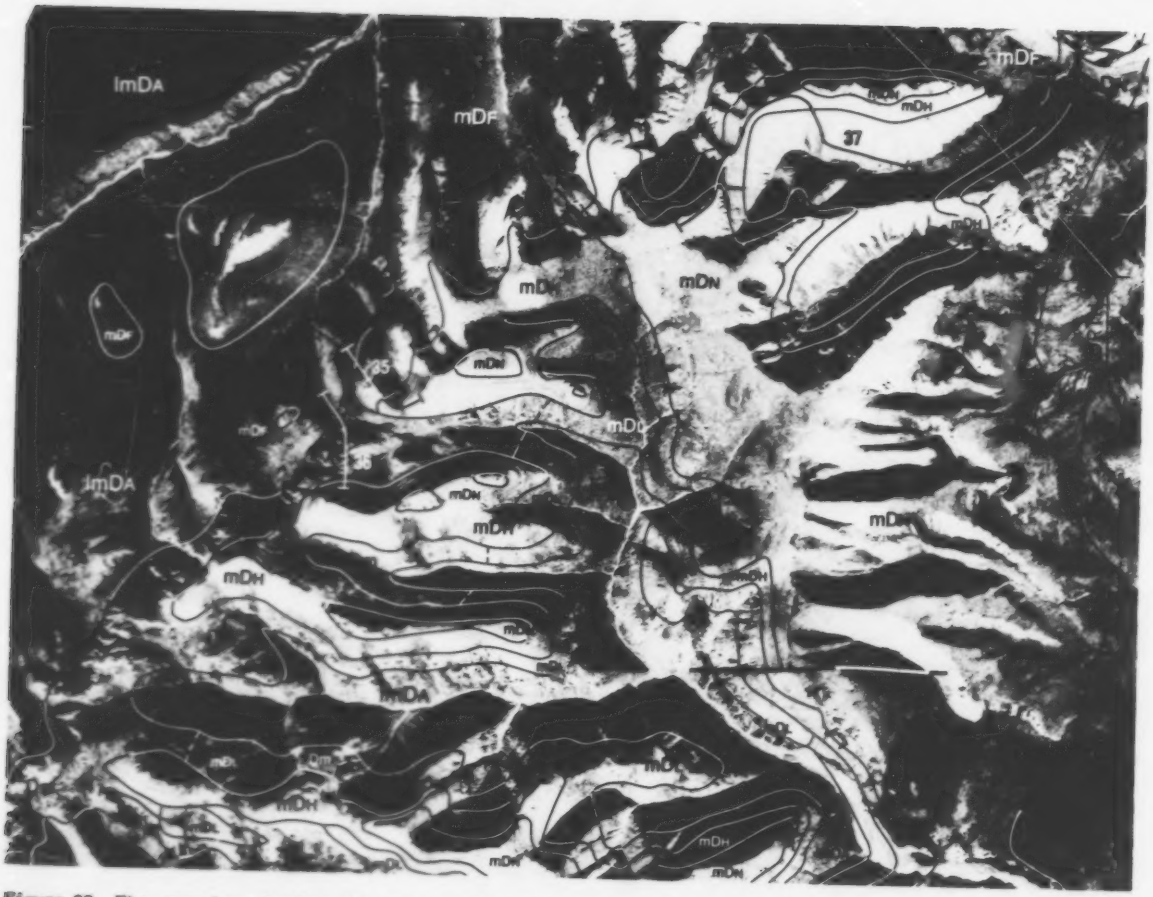


Figure 69. *The complex stratigraphic relationships between the Arnica, Funeral, Landry, Headless and Nahanni formations and the Manetoe facies are well illustrated on Ram Plateau, as may be seen on this segment from RCAF air photo, Number A:17441-92. Note the abrupt contact between the Manetoe facies and the Funeral Formation at sections 35 and 36, and the dotted, approximate, contact between the Manetoe facies and the Landry and Nahanni formations. Symbols as on Figure 81 (legend).*

Funeral Formation

Introduction

The Funeral Formation (mDF) was defined by Douglas and Norris (1961, p. 17) as the buff, recessive weathering limestones and shales that overlie the Arnica and underlie the Headless. They regarded the Funeral Formation as being the lateral facies equivalent of the upper part of the Arnica Formation and of the Manetoe Formaton in the Sibbeston Lake and Virginia Falls map areas (Fig. 2) and of the Landry Formation north of these areas. However, the data acquired in this study indicate that the Landry Formation is the only lateral facies equivalent of the Funeral Formation (Fig. 2). The diagenetic Manetoe facies, composed of coarsely crystalline white dolomite, has partly obscured the fundamental relationships between the Funeral Formation and its shelf carbonate equivalents. The Funeral is widely exposed throughout the Virginia Falls and Root River map areas but forms a recessive slope with little solid outcrop. Direct measurement of stratigraphic sections on these slopes is, in most instances, impossible.

Douglas and Norris (1961) designated the Funeral Formation exposed on northern Nahanni Plateau in the Virginia Falls map area as the type section and estimated a thickness of 2550 feet (777 m) for the Funeral at this locality. However, the Funeral Formation in Section 35 (assumed to be the type section) immediately adjacent to the carbonate shelf edge (Fig. 70), is in fact only 228 m thick. Even in the relatively small area of northern Nahanni Plateau the thickness of the Funeral Formation varies considerably. Section 19, kindly contributed by Banff Oil Ltd. (Banff Sec. BG-6-68), is located a little farther from the shelf edge and hence is somewhat thicker at 466 m (1528 ft). In addition, although the Funeral sequence exposed in Section 39

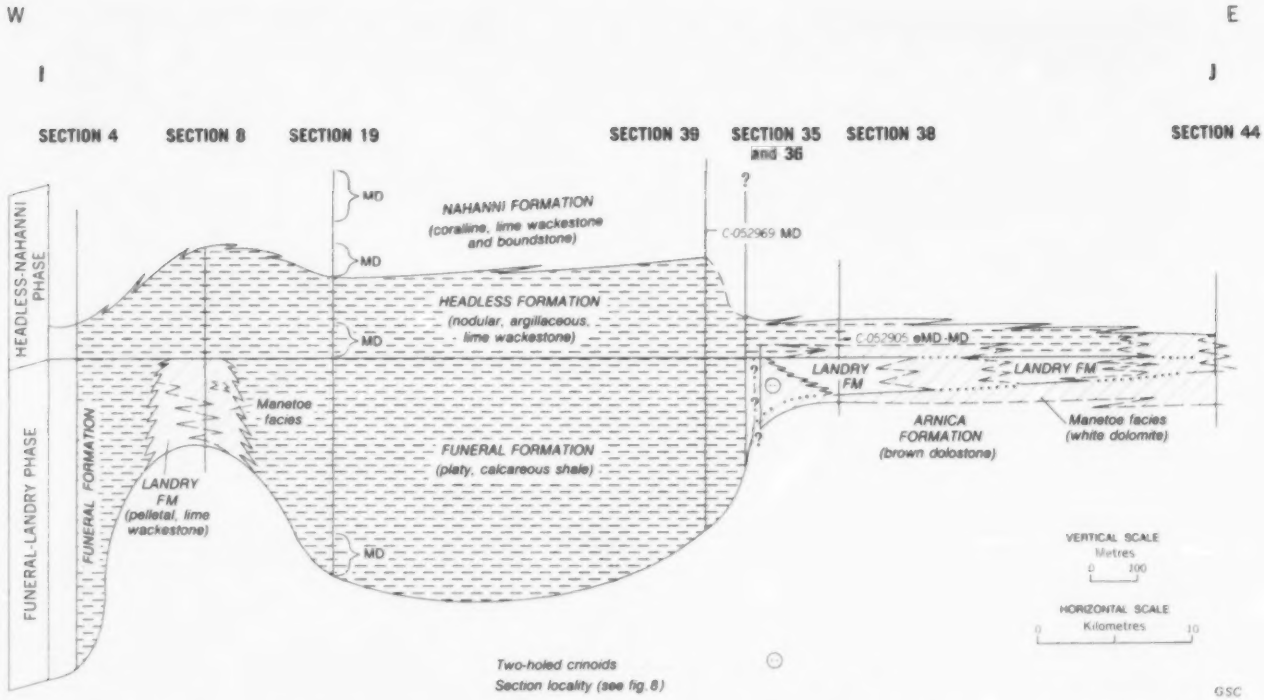


Figure 70. *A stratigraphic cross-section of the Funeral-Headless assemblage along the line of section I-J in Figure 8, in the northern part of Virginia Falls map area. This line of section passes through the transition between the Manetoe facies at the shelf edge and the platy shales of the Funeral Formation.*

is intermediate in thickness between the two Funeral sections cited above and is close to the type area, it is incomplete, although the Arnica Formation probably occurs only a few metres below the base of the exposed section. The Funeral sequence exposed in Section 35 is interpreted here to be the original type section, and Section 39 is designated as a well exposed reference section of the Funeral Formation. Most well exposed sections suffer from the defect of having covered basal contact with the Arnica Formation.

Lithology, sedimentary structures, distribution and thickness

In the reference section, Section 39, the basal 130 m contain a large proportion of calcareous, brownish yellow or buff weathering, silty shale that is sapropelic and pyritic with scattered pyritized fish fragments. The high iron content of Funeral samples (Table 2) probably reflects the pervasive presence of pyrite. Vague current lineations occur on some bedding surfaces. More resistant limestone ribs in this part are composed of thin to very thin, planar and smooth bedded, dark grey, argillaceous lime mudstone or calcilutite that weathers medium yellowish grey. Thin argillaceous or shaly partings separate individual beds. Syngenetic pyrite outlines contortions in thin, one millimetre thick, laminations within lime mudstone beds, and in thin section these mudstones commonly have a micropelletal texture (Wilson, 1963). In the lower part of the Funeral, the limestone ribs tend to be widely separated by shaly intervals, whereas in the upper part they tend to occur in more closely spaced groups of intervals or ribs. The upper part contains the same lithologies as the lower part but in different proportions with platy lime mudstone constituting as much as 90 per cent of the sequence. Thin, recessive, yellow weathering shale intervals, 1 to 2 m thick, separate the thick, argillaceous limestone intervals in the upper part.

In Section 39, the Funeral limestone beds are almost entirely unfossiliferous, but in other sections, such as sections 11 and 19, a few limestone beds in the upper part of the Funeral contain crinoids and brachiopods. A sparse pelagic fauna occurs also throughout the Funeral Formation.

The regional dip divergence between the Funeral and the overlying Headless Formation is well illustrated in Figure 71 (a view of type section of the Funeral near the north end of Tundra Ridge), and has previously been interpretated as an unconformity (Brady and Wissner, 1961). An alternate interpretation is that the bedding dip of the Funeral, relative to the overlying Headless, represents the original divergence in the dip of sedimentation surfaces in the Funeral relative to sedimentation surfaces in the Headless, modified by postdepositional processes, such as compaction. If the base of the Headless Formation may be regarded as an isochronous surface then the sloping bed surfaces in the Funeral relative to bedding surfaces in the Headless may be interpreted as an original depositional slope reflecting their origin as foreslope beds or clinoform surfaces on the front of a prograding mudbank (Rich, 1951).

Direct evidence for slope deposition in the Funeral Formation occurs in the Funeral sequence exposed at Section 11. Abundant, moderately thick mudflow or turbidite deposits, up to 1 m thick (Fig. 72), are scattered in groups

Figure 71. A northeastward panoramic view of the contact between the Headless and Funeral formations at Section 19, east of Tundra Ridge. Beds of the underlying Funeral Formation are not parallel with the contact but, instead, form an acute angle with it that may reflect the divergence in depositional dip between the Headless and Funeral formations. Symbols as on Figure 81 (legend) (ISPG Photo No. 1420-17 and 18).

Figure 72. A mass flow deposit in the light brown, calcareous shales of the Funeral Formation. This nodular mass flow deposit rests with a sharp contact on platy, calcareous shale and grades upward into platy shale. The nodular fabric in the main part of the flow may be the lithified equivalent of an accumulation of mud lumps or fragments that underwent plastic deformation during transportation and sedimentation, or, it may be a diagenetic fabric related to dewatering during compaction and lithification. 316.5 m above the base of the Funeral Formation in Section 11 (ISPG Photo No. 837-69).

throughout units 31 to 33 in the upper part of the section (Appendix 3). Also, where the Funeral is particularly sandy, as in unit 30 of Section 11, laminae couplets of sand grading up into shaly siltstone occur in the lower part of the unit. In the upper part, the sand content is reduced, couplets are less evident, and faint groove marks occur on the bases of some laminae. These features, indicative of slope deposition, are absent in the overlying Headless Formation.

The Funeral Formation is exposed throughout the northern part of the Virginia Falls map area and in the northwest part of the Sibbeston Lake map area. It thickens basinward from about 100 m at its contact with the Landry Formation to a maximum of nearly 700 m near the north end of the Arnica Range on the west side of the Sombre Salient (figs. 68, 70). The data base for the thickness of the Funeral Formation is small, with the result that the Funeral-Landry isopach map presented in Figure 67 is somewhat interpretive. However, available data indicate that there may have been a submarine ridge or sill extending west-northwest across Prairie Creek Embayment (Fig. 67) to cause the observed thinning of the Funeral Formation along this trend. The Funeral Formation extends farther north and is exposed throughout the Root River map area.

Contact relationships, age, correlation and faunas

The Funeral Formation rests with an abrupt conformable contact on the Arnica Formation, or on the Sombre Formation in areas adjacent to Prairie Creek Embayment where the Arnica Formation is absent (Fig. 68). The character of the upper contact with the Headless Formation is more difficult to ascertain. As discussed in the previous section, the large scale divergence between bedding in the Headless and Funeral formations has been interpreted (Brady and Wissner, 1961) to indicate an angular unconformity between these formations in the Virginia Falls area, but an equally likely alternative, favoured here, is that the inclination of bedding surfaces in the Funeral relative to beds in the Headless Formation represents the original depositional dip of beds in the Funeral.

Shelfward the Funeral passes into the Landry Formation or its dolomitized equivalent, the Manetoe facies of the Landry Formation (Fig. 68). This is in contrast to the interpretation of Douglas and Norris (1961) who regarded the Funeral Formation as being the lateral facies equivalent of both the Arnica and Manetoe formations. They did not recognize that the Manetoe Formation which they (Douglas and Norris, 1976a) mapped is a diagenetic overprint on pre-existing strata of the Landry and Arnica formations. Like Noble and Ferguson (1971), the writers found no direct evidence to indicate that the upper part of the Arnica Formation passes laterally to the Funeral Formation. The Funeral Formation is markedly thinner near the Landry shelf edge, giving the impression that the lower part of the Funeral Formation passes laterally to the upper part of the Arnica, but the contact between the Funeral and the Arnica is everywhere sharp and conformable and nowhere has the Arnica been seen to intertongue with the Funeral.

The transition from the Manetoe facies to the Funeral Formation in the Ram Plateau Region is well illustrated in Noble and Ferguson (1971, p. 584) and in figures 69 and 70. Unlike Noble and Ferguson (1971) the writers interpret the shelf edge carbonates at this locality to be a crinoid bank accumulation rather than a reefal shelf edge (Sec. 36 in Appendix 1). Also, it is probable that the Funeral Formation shales at Ram Plateau postdate most of the laterally adjacent carbonate shelf edge because no crinoid-bearing sediment gravity flow deposits or blocks were found in these shales (e.g. Sec. 35). The apparent large scale intertonguing of the shelf edge carbonates and shales shown in Noble and Ferguson (1971) may be illusory and merely reflect the submarine topography of the shelf edge on which the shales were deposited. Basinward, the Funeral Formation merges with the shales and shaly limestones of the Road River Formation in the southwest part of the Virginia Falls map area.

Faunas in the Funeral are sparse and are confined in most sections to the nektonic invertebrate *Styliolina* sp. and occasional ammonoids and orthoconic cephalopods. A few thin, individual, fossiliferous beds in Section 39 contain brachiopods such as *Desquamatia aperanta*, *Emanuella*, *Spinatrypa coriacea*, and *Warrenella kirki*, and crinoid and trilobite fragments. These faunas and the stratigraphic position of the Funeral above the Arnica and below the Headless indicate that the Funeral is entirely Couvinian in age. This is in agreement with Chatterton (1978) who indicated that the Funeral in the southern Mackenzie Mountains is latest Emsian to early Eifelian in age, based on conodont data.

THE HEADLESS-NAHANNI PHASE

Headless Formation

Introduction

The Headless Formation (mDH) was defined by Douglas and Norris (1961) as the recessive shale and argillaceous limestone unit that separates the Nahanni Formation from the underlying formations. They suggested that the Headless strata exposed in the Headless Range; on a tributary to Meilleur Creek; and at First Canyon on the South Nahanni River, are typical of its regional development. However, each of these areas had disadvantages as a type locality. Sections of the Headless Formation in the Headless Range, although well exposed, are virtually inaccessible on the ground. Sections near Meilleur Creek are not well exposed and may contain some Funeral Formation within strata previously considered to be Headless. The Headless interval in Section 39 is thin and not particularly fossiliferous or argillaceous. The most complete exposure of the Headless Formation was encountered in the Ram Plateau area, and the writers designate as a reference section the Headless strata in the Ram Plateau 1 section (Sec. 39), at 61°45'N latitude and 124°25'W longitude (Fig. 70; Appendix 1). At this locality the Headless is 213 m thick and overlies the Funeral Formation. In heavily vegetated areas of low relief, such as along the south ends of the Arnica and Manetoe ranges (Fig. 81, in pocket), it is difficult to separate Headless and Funeral strata for mapping purposes. Elsewhere, around the Ram Plateau area for example, the Headless is readily mappable as a unit distinct from the Funeral. Both the Headless and Nahanni formations have been the object of a previous, more detailed investigation by Noble and Ferguson (1971).

Lithology, sedimentary structures, distribution, and thickness

The Headless is widely distributed throughout the Virginia Falls map area. The dominant lithology at the type section (Appendix 1) is recessive, rubbly weathering, argillaceous lime wackestone that weathers greenish grey and is mottled orange in some places. These argillaceous limestones are thin bedded with discontinuous, wavy to irregular, argillaceous partings and display some nodular bedding. Some of the bed surface irregularities are caused by fossil material, particularly crinoids and brachiopods. Other causes for these irregular surfaces are bioturbation and, perhaps, differential cementation during compaction, which would tend to form nodular bedding. Compaction would exaggerate pre-existing bed surface irregularities. The upper part of the type section contains some unfossiliferous, yellow weathering, calcareous, platy shale and argillaceous limestone that are similar to the shales and limestones of the underlying Funeral Formation.

These lithologies are typical of the Headless Formation in the western and central parts of the Virginia Falls map area where it ranges in thickness up to a measured maximum of 250 m. Eastwards, toward the Sibbeston Lake map area, the Headless becomes progressively thinner and reduces to 7.5 m at the Nahanni Butte Section (Sec. 45) where it is only slightly argillaceous. At Nahanni Butte, most of the green, argillaceous and silty material is present as a sparse matrix between discoidal lime mud lumps. These mud lumps, or intraclasts, are concentrated in small pods oriented parallel to bedding in a skeletal, pelletal and intraclastic wackestone and packstone. These rocks also display lenses of spar-cemented grainstone containing abraded and micritized crinoid, brachiopod and ostracode fragments, calcispheres, and possible charophyte oogonia.

Contact relationships, age, correlation and faunas

The Headless Formation abruptly overlies the Funeral and Landry formations. Brady and Wissner (1961) regarded

this contact as an angular unconformity because of the divergence of bedding between the Headless and that in the underlying Funeral Formation in the Virginia Falls map area. There is some evidence against the presence of an unconformity:

1. No evidence of erosion, such as a scoured or corroded contact was observed at either the Funeral-Headless contact or the somewhat better exposed Landry-Headless contact.

2. The interpretation of the Funeral Formation as being largely the product of slope deposition with depositional surfaces steeper than those which prevailed during deposition of the Headless Formation, as evidenced by slope deposits in the Funeral.

Douglas and Norris (1961) regarded the base of the Headless as a disconformity because of the facies variations in underlying beds. The lack of erosional features at the base of the Headless in the Virginia Falls area contradicts this interpretation, but it is possible that the basal part of the Headless is a condensed sequence. Law (1971, p. 451-452) suggested that, in the the subsurface east of the Nahanni Range, the base of the Headless and its eastward correlative, the Ebbutt Member, marks a disconformity followed by a marine transgression that extends eastward up over the Cathlina High. It is possible that the shales of the Funeral Formation were deposited during the erosional episode represented by this disconformity. The base of the Headless also is correlative with the middle detrital zone of the Chinchaga Formation in Alberta and British Columbia (Law, 1971), which again is considered to represent an unconformity (Belyea, 1970).

The Nahanni Formation overlies and laterally interfingers with the upper part of the westward-thickening Headless Formation (Fig. 68), as has been described by Douglas and Norris (1961, 1976a) and Noble and Ferguson (1971). Eastward, in the subsurface, as previously mentioned, the lower part of the Headless Formation passes laterally into the Ebbutt Member, the silty and shaly lower part of the Willow Lake Formation, and the upper part of the Chinchaga Formation (Law, 1971).

Brachiopods form the dominant part of the fauna in the abundantly fossiliferous Headless Formation and include types such as *Eoschuchertella adoceta*, *Spinulicosta* sp. cf. *S. stainbrooki*, *Atrypa*, *Emanuella* and *Warrenella* (Appendix 2). Some trilobites (*Dechenella*), bryozoans, corals (*Thamnopora*) and pelecypods are present and crinoids are abundant. Tentaculitids are common. Conodonts identified include *Polygnathus parawebbi*, *Polygnathus linguiformis linguiformis*, and *Steptotaxis pedderi*. All of these faunas indicate a Couvinian (Eifelian) age for the Headless Formation (see Chatterton, 1978).

Nahanni Formation

Introduction

The Nahanni Formation (mDN), originally defined by Hage (1945) as the 450 feet of limestone beds that form the upper part of the south facing cliffs of Nahanni Butte, was redefined by Douglas and Norris (1961, p. 14) to exclude the argillaceous limestones of the Headless Formation at the base of the limestone upper cliffs at Nahanni Butte. At the type section at Nahanni Butte (61°05'N latitude and 123°20'W longitude; Sec. 43) the measured thickness of the Nahanni Formation is 195.5 m (641 ft). This may not be a complete thickness as the uppermost beds of the Nahanni Formation at Nahanni Butte may have been eroded.

The Nahanni Formation is the resistant caprock at the top of the lower Paleozoic carbonate platform sequence in the Mackenzie Mountains. Thick, recessive, Middle and Upper Devonian and Mississippian shales, siltstones and sandstones overlie the Nahanni Formation and its northern correlative, the Hume Formation, throughout the Mackenzie Mountains. The upper contact of the Nahanni tends to be a poorly exposed erosional surface, because the overlying shale is very recessive. On the north side of First Canyon on the South Nahanni River in Nahanni National Park the well known Nahanni Caves are developed in the Nahanni Formation (Ford, 1976). Noble and Ferguson (1971) have previously examined the Nahanni Formation and consequently it is not discussed in detail in this report.

Lithology, sedimentary structures, distribution and thickness

At the type section, most of the Nahanni is medium grey, medium- to thick-bedded, fossiliferous wackestone containing abundant crinoids, brachiopods, amphiporids and corals, commonly concentrated in individual beds. Some wackestone beds are burrow mottled and some of the more fossiliferous beds contain abundant black bitumen and sapropel, such as along the amphiporid-bearing zones of unit 13 (Appendix 1). Thin zones of fenestral fabric underlie some burrow mottled beds. Important lithologies of diagenetic origin include the dolomite of the Manetoe facies in the lower part of the section, and the silicified breccia bodies, several metres thick and up to 10 m across, that occur near the contact between the Nahanni and the overlying shale. Fossiliferous, medium- to thick-bedded wackestone is typical of most of the Nahanni Formation throughout the report area, but stromatoporoidal and coralline boundstone forms a significant part of the Nahanni sequence in Section 38.

Complete sections of the Nahanni Formation are rare because the upper contact is commonly covered. The available data (Table 1) suggest that the Nahanni ranges approximately in thickness from 100 m to 300 m. It has the most widespread distribution of all the lower Paleozoic shelf carbonate units in the report area. The westernmost limit of the Nahanni is largely linear and does not follow the more complex geometry of the basinward edge of the underlying Landry Formation (Fig. 67).

Contact relationships, age, correlation and faunas

The Nahanni Formation is laterally equivalent to and overlies the Headless Formation with a conformable gradational contact (Fig. 68). Beyond the westward limit of the Nahanni, time equivalent strata are contained entirely within the Headless interval and, farther west, within the Besa River Formation. The shales, siltstones and sandstones of the Horn River and Fort Simpson formations overlie the Nahanni Formation with an abrupt but conformable contact (Fig. 68). Brady and Wissner (1961, p. 58-59) observed Nahanni limestone interbedded with the overlying shale for

several metres at a gradational contact along Ram River. The impression of a very sharp upper contact is the result of the erosional stripping of the overlying shaly recessive strata to expose large areas of the top surface of the uppermost resistant bed of the Nahanni Formation. Eastward, the Nahanni passes to the Lonely Bay Formation and the upper part of the Chinchaga Formation in the subsurface.

Faunas from the Nahanni Formation identified during the course of this study include the corals, *Favosites*, *Thamnopora* and *Coenites* and the brachiopod *Desquamatia* cf. *D. aperanta* from the *Eoschuchertella adoceta* Zone, indicating a Couvinian (Eifelian) age for most of the Nahanni (Appendix 2). A less completely identified fauna includes crinoids, corals, hemispheroidal and laminar stromatoporoids, bryozoans, brachiopods and trilobites. Noble and Ferguson (1971), in a detailed biostratigraphic and paleoecological study, subdivided the combined Nahanni-Headless interval in the report area into three biostratigraphic zones (see also Crickmay, 1960; Pedder, 1975). In ascending stratigraphic order these zones are: the *Eoschuchertella adoceta* Zone, the *Radiastraea verilli* Zone (or *Dysmorphostrata* Zone of Pedder, 1975), and the *Leiorhynchus castanea* Zone. The lower two zones are Couvinian (or Eifelian) in age but the uppermost zone is considered to indicate a Givetian age. Chatterton (1978) provides more data concerning conodonts from the Nahanni Formation.

DEPOSITIONAL AND TECTONIC SUMMARY OF THE FUNERAL-HEADLESS ASSEMBLAGE

At the close of deposition of the Prairie Creek assemblage, after deposition of the Arnica Formation, large parts of former shelf bordering the Prairie Creek Embayment subsided below wave base and Root Basin was re-established as a bathymetric feature. Deposition of the Funeral-Landry phase of the Funeral-Headless assemblage began during this phase. Although the embayment was largely obliterated some remnants were preserved, such as the Sombre Salient, which previously defined the west side of the embayment (Fig. 67).

Pelletal wackestones and packstones of the Landry Formation accumulated on the shelf contemporaneously with the argillaceous dolostones and limestones of the Funeral Formation that filled the basinal areas. The packed, silt-size, micritic, carbonate fragments that constitute the bulk of the Funeral sediments, resemble the micropellets or micropelletoids described by Wilson (1963) as one of three typical microfacies commonly developed in carbonate sediments deposited below wave base. An obvious source for these micropellets is the pelletal sediments of the Landry that accumulated updip on the shelf. Pelletal sediments at the shelf edge may have moved downslope as thin turbidites or turbidite-like sediment gravity flows to form individually graded thin beds. Possibly, many flows were initiated at the seaward mouths of tidal channels, inferred to have reworked Landry sediments in some areas. Soft pellets in these flows may have partly disaggregated to micropellets during downslope movement. Terrigenous silt and clay were introduced into areas of Funeral deposition by longshore currents that moved along the bottom and sides of the Funeral Basin. Sediment gravity flows incorporated some of this terrigenous material during downslope movement.

Funeral sediments accumulated on the sloping surface, or clinoform (Rich, 1951), of a basinward-prograding mudbank that eventually filled the Funeral Basin to near, or at, wave base, particularly where beds of Landry limestone interfinger with and cap Funeral sequences. In places, such as at Ram Plateau where the Funeral contact with shelf carbonates is confined to a narrow zone only a few hundred metres wide, Funeral sediments appear to have built up onto a pre-existing shelf edge occupied by crinoid banks. These banks significantly predate the laterally adjacent Funeral sediments. However, the absence of the Landry Formation at this shelf edge locality, and its presence farther landward on Ram Plateau, remains anomalous.

The dearth of fossils, in the Landry, apart from ostracodes, suggests that environmental conditions during deposition departed from normal marine. Braun (1966, 1978) found that even the ostracode assemblage (upper DM4; Braun, 1978, p. 272) of the Landry Formation is of low diversity, indicating a "restrictive" (Braun *ibid.*) environment of deposition. He also suggested that the pyritic, shaly limestones of the Funeral Formation represent a euxenic environment of deposition that was inimical to benthonic life. Landry environmental conditions remain open to speculation.

There are some indications that the Landry-Funeral seas were hyposaline or brackish rather than hypersaline. No evaporites occur in the Landry in the report area or the remainder of the Mackenzie Mountains which, in itself, discounts an evaporitic or hypersaline setting. In addition, charophyte oogonia occur in Landry strata in the northern Mackenzie Mountains, perhaps indicating a brackish environment of deposition, or an environment with widely varying salinities.

The proposed euxinic setting for the Funeral Formation may have developed in a hyposaline setting analogous to that of the modern Black Sea (Deuser, 1974). Unlike the Black Sea, however, the Funeral Basin was not a catchment area for continental drainage because it was not surrounded by land. Another possibility is that the Funeral was deposited at a depth that coincided with an open ocean anoxic layer (Desmaison and Moore, 1980). But, this does not explain the lack of fauna in the Landry Formation deposited on the shelf. Perhaps solution of some of the underlying evaporite deposits in the Bear Rock Formation, by the Landry shelf sea, raised salinity sufficiently to inhibit biological growth.

After deposition of the Funeral-Landry sequence the Mackenzie shelf was submerged by a widespread transgression which initiated deposition of the Headless-Nahanni phase. Open, normal marine, fossiliferous and argillaceous lime muds of the Headless Formation formed a gently westward-dipping slope leading down from prograding shallow water shelf sediments. These shelf sediments consist of crinoidal and coralline lime wackestones and boundstones of the Nahanni Formation, as outlined by Noble and Ferguson (1971). Together, the Headless and Nahanni formations appear to blanket the area without regard to underlying facies changes. There is little indication that the Prairie Creek Embayment or Root Basin influenced deposition of the Headless-Nahanni phase (Fig. 67). However, the Headless Formation tends to become abruptly thicker in passing from areas where it overlies Landry to areas where it overlies the Funeral (Fig. 70), and the overlying Nahanni tends to be more reefal. To some extent, this phenomenon may be due to either infilling or residual bathymetric relief that remained at the close of Landry-Funeral deposition. Differential compaction may have exaggerated the original relief. An alternate hypothesis is that the downwarping that influenced Funeral-Landry deposition may have continued during deposition of the Headless Formation, resulting in thickness variations.

Law (1971, p. 450) suggested that a brief period of regional uplift caused the development of the unconformity beneath the Headless Formation and the Ebbutt Member east of the Nahanni Range. Alternatively, a eustatic drop in sea level during Couvinian time may have promoted development of this unconformity. The small, Middle Devonian drop in sea level (illustrated in the sea level curve of Vail et al., 1977), which interrupts the overall Devonian rise in sea level, could coincide with the sub-Headless unconformity (Fig. 20). Alternatively this sea level drop may reflect a somewhat younger event. More details concerning the curve of Vail et al. (1977) are required to verify the exact position of their Middle Devonian sea level drop with respect to stages in the Devonian System.

The uplift, or sea level drop, associated with the sub-Headless unconformity was followed by a Late Couvinian transgression accompanied by deposition of the Headless and Nahanni formations of the Headless-Nahanni phase. This phase marked the end of carbonate deposition in the Mackenzie Mountains and, instead, shale was deposited throughout this region. This change in sedimentation occurred during a steady rise in sea level (Fig. 20), and during both the Late Devonian Ellesmerian Orogeny of the Arctic Islands and the Antler Orogeny of the western United States.

THE MANETOE FACIES DOLOMITE – A DIAGENETIC FACIES

The Manetoe facies (Dm) has been mentioned briefly above in connection with the Arnica, Landry and Nahanni formations. The type section of the Manetoe Formation is at First Canyon (Sec. 40; Fig. 47) on the South Nahanni River in the Virginia Falls map area (Douglas and Norris, 1961, p. 15). Douglas and Norris (1976a) described and mapped the formation as a thin unit of massive, coarsely crystalline dolomite overlying the Arnica Formation and underlying the Headless Formation in the Virginia Falls area (Fig. 81, in pocket).

The white Manetoe dolomite is locally a readily mappable unit and as such deserves recognition. The difficulty with according formational status to this unit is apparent from outcrop examinations at many localities. Previously, it has been generally assumed that the coarsely crystalline Manetoe dolomite is coextensive with a 'Manetoe' reef or barrier reef (Brady and Wissner, 1961; Noble and Ferguson, 1971; Law, 1971). However, in most areas, including the type section locality, the Manetoe dolomite extends stratigraphically upward from the Arnica Formation into a recognizable Landry Formation limestone beneath the Headless Formation (figs. 68, 70). Manetoe dolomite is interbedded with Landry limestone throughout a large part of the Virginia Falls map area (Fig. 73).

At the Manetoe type section, as at many localities, the Arnica Formation becomes very thick bedded and reefal toward its upper contact with the Landry limestone (Fig. 47). It is this predominantly vuggy, biostromal zone that is the host for the lower part of the Manetoe facies. Some coarsely crystalline Manetoe dolomite has replaced biostromal dolostone beds *in situ*, but much of this dolomite appears to have infilled cavernous megaspores (Choquette and Pray, 1971). At First Canyon there are several 10 m thick zones of coarsely crystalline white dolomite that appear to be cavern fillings. Large, irregular blocks of dark grey, host reefal

Figure 73. *Bluish grey weathering, pelletal wackestone of the Landry Formation, interbedded with more recessive, white, coarsely crystalline dolomite of the Manetoe facies. 105 m above the base of the Landry Formation in Section 8 (ISPG Photo No. 837-113).*

dolostone were observed at the bases of some of these white dolomite bodies as well as up to one metre of gently crossbedded carbonate silt and sand (Fig. 74). These features strongly suggest that the extensive bodies of white dolomite originated largely as open space filling of cavernous porosity. Also, there are zones of extensive solution-collapse breccia cemented by white dolomite, and 'zebra' dolomite, where white dolomite occurs intimately interlaminated with the finely to medium crystalline, grey, host dolomite.

In the Virginia Falls map area, white Manetoe dolomite is restricted generally to strata beneath the Headless shale, although, in some places, beds of Manetoe dolomite occur within the Headless Formation. However, farther east in the Nahanni Range, Manetoe dolomite is not restricted stratigraphically in this manner but, instead, extends upward to the top of the Nahanni Formation. At Nahanni Butte, near the type section of the Nahanni Formation, there is a spectacular example where a zone of chaotic solution-collapse breccia, 5 to 15 m wide, extends upward from strata mapped as Manetoe facies in the Arnica Formation (Fig. 75) to the top of the Nahanni Formation (Fig. 76). The dark grey Nahanni pelletal wackestone and packstone around these vertical breccia bodies are partly replaced by coarsely crystalline, white to light brown dolomite (figs. 77, 78). Typically, this *in situ* dolomite extends along the bedding for different distances beyond the solution-collapse breccia, and

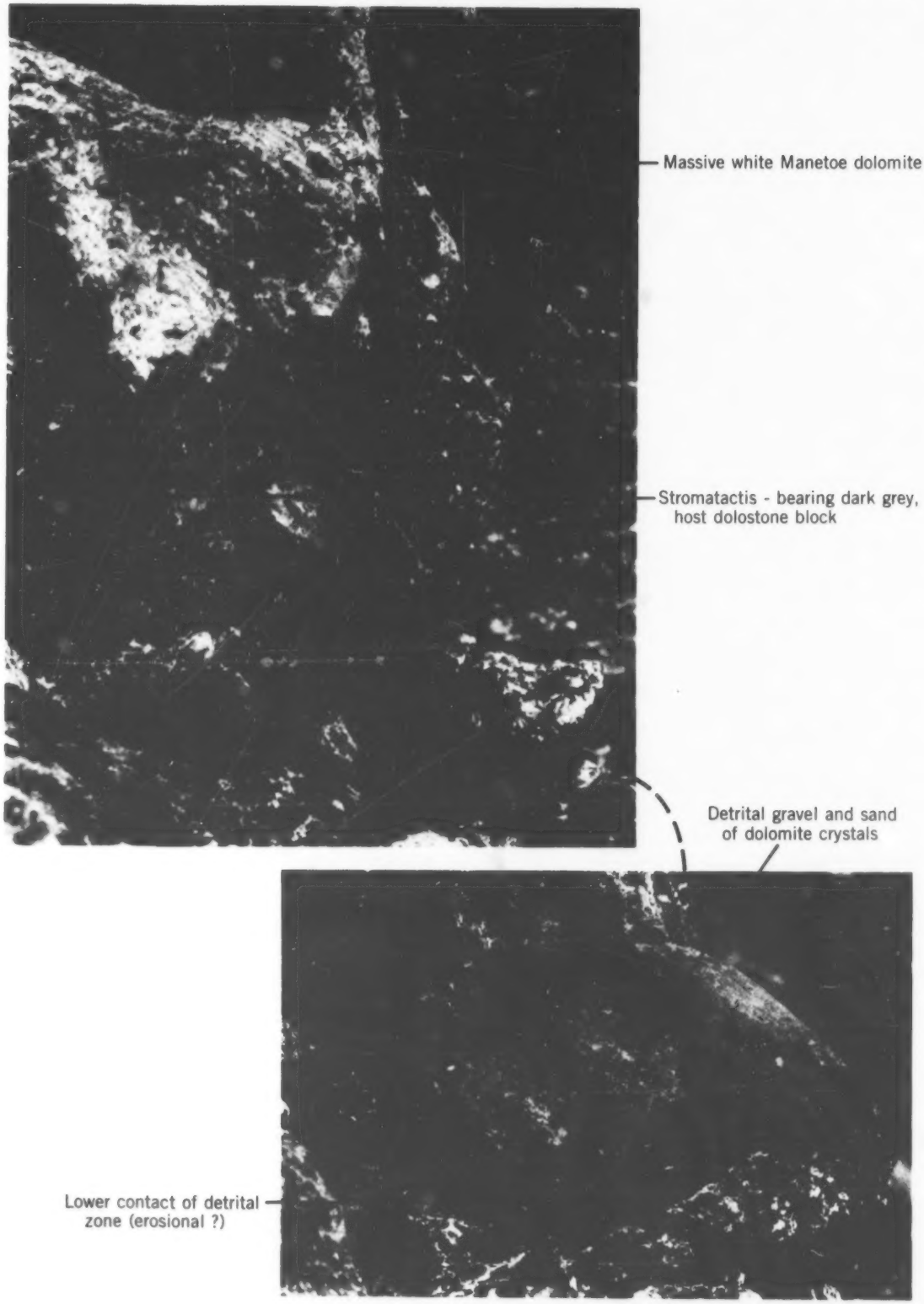

Massive white Manetoe dolomite
Stromatactis - bearing dark grey, host dolostone block
Detrital gravel and sand of dolomite crystals
Lower contact of detrital zone (erosional ?)

Figure 74

Figure 75. *Coarse mosaic of breccia fragments of dark brownish grey dolostone of the Arnica Formation, encased in white, coarsely crystalline dolomite of the Manetoe facies. Some zebra dolomite fabric in some breccia blocks. 9.5 m below the top of the Arnica Formation in Section 45 (ISPG Photo No. 1420-16).*

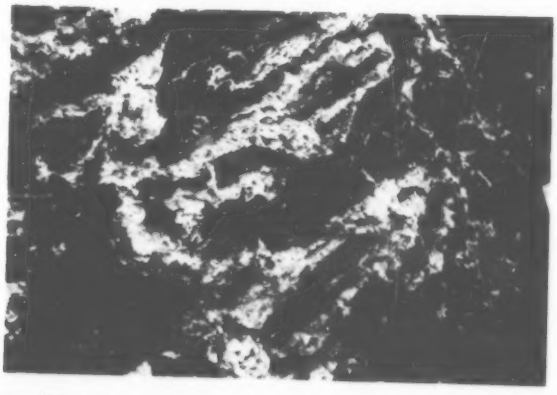


Figure 76. *An exposure of Manetoe facies dolomite in the Nahanni Formation at Nahanni Butte. Tongues of light brown Manetoe dolomite extend into dark grey, lime wackestones of the Nahanni Formation toward the left (west) side of the exposure. A central core of breccia and white dolomite is on the right side (east). Farther east, beyond the area shown on this photograph, tongues of light brown dolomite extend eastward into limestones of the Nahanni Formation. The base of the strata in the photograph is about 4 m above the base of the Nahanni Formation, in Section 45 (ISPG Photo No. 710-47).*

Figure 74. *A large, open space or cavern fill of white, coarsely crystalline dolomite of the Manetoe facies in the Arnica Formation. Light yellow and orange weathering, weakly crossbedded, detrital, dolomite-crystal silt and sand rests with an erosional contact on coarsely crystalline, white dolomite in the lower part of the exposure. The upper part of the exposure is mainly white, open space filling dolomite with a large block of dark grey, stromatactis-bearing dolostone, containing possible stromatoporoids, resting on the detrital dolomite. The base of this exposure is about 19 m below the top of the Arnica Formation in Section 40 (ISPG Photo No. 837-11 and 1420-15).*

some beds may be dolomitized many tens of metres beyond the breccia (Fig. 76). The contact between individual beds of dolomitized and nondolomitized limestone can be sharp (Fig. 78) or become diffuse over a distance of less than one metre (Fig. 77). Similar breccia bodies with accompanying dolomitization have been observed in strata mapped as Arnica, Manetoe, Landry, Headless and Nahanni farther north (Brady and Wissner, 1961). There is no doubt, however, that this dolomite is not associated solely with reefal sediments.

Observations concerning the white, coarsely crystalline Manetoe dolomite, examined during the course of this study, may be summarized as follows:

1. Manetoe dolomite occurs both as an open space filling and as a replacement phase in strata that are recognizable as either Arnica, Landry, Headless or Nahanni precursor lithologies.

2. Where the Headless shaly limestone is thick, as in the Virginia Falls map area, the Manetoe dolomite is confined to strata within or beneath the Headless Formation. Toward the east, in the Sibbeston Lake map area where the Headless shale is thin, the Manetoe dolomite extends upwards, locally even to the top of the Nahanni Formation.

The first observation precludes the use of the Manetoe dolomite as an element in paleogeographic reconstructions. Most paleogeographic reconstructions incorporating the Manetoe Formation present it as being essentially a reef facies (e.g. Law, 1971, p. 447). The widespread occurrence of Manetoe dolomite in a diversity of strata and carbonate facies and the mode of its occurrence strongly suggest that it is the result of a regional diagenetic process that occurred after lithification and burial of these strata. Consequently, it is more appropriate to regard the Manetoe dolomite as a diagenetic facies that is superimposed, primarily on the Arnica and Landry formations, but also on the Headless and Nahanni formations and not as a formation itself.

The second observation suggests that the diagenetic fluids involved in the formation of Manetoe dolomite were confined beneath the Headless shaly limestone in the Virginia Falls map area, but were not confined in the Sibbeston Lake map area, where the Headless Formation is thin. Possibly the cavernous porosity and solution-collapse breccias of the Manetoe reflect the development of a large, late Middle Devonian, coastal aquifer in this sequence, similar to, and perhaps coextensive with, the postulated late Middle Devonian aquifer of northeastern British Columbia (Morrow et al., 1978; Morrow, 1975). In this scenario the Headless Formation may have acted as an upper confining impermeable layer. The relative absence of the Headless Formation farther east may have allowed aquifer fluids to circulate upwards into the Nahanni Formation in the Sibbeston Lake map area. The extensive late Middle Devonian unconformity at the top of the Sulphur Point Formation, in the Presqu'ile Barrier Complex to the southeast, could have been the recharge area for a coastal aquifer that extended northwestward beyond the Presqu'ile Barrier (Morrow et al., 1978). Mixing of fresh water and seawater during the growth and eventual collapse of this aquifer may have caused the extensive Manetoe dolomitization, in addition to the late diagenetic white dolomite in the Lower Devonian Stone Formation of northeastern British Columbia (Morrow, 1975). It is of interest in this regard to note that the Manetoe dolomite does not extend farther north than the southern part of the Root River map area (Douglas and Norris, 1976c), except along the Camsell Range. There, it extends to a point just north of the Root River map area (Douglas and Norris, 1963; Douglas, 1976) and no farther west than the western part of the Glacier Lake map area (Gabrielse et al., 1973).

Douglas and Norris (1961, p. 17) remark that in the Root River map area Manetoe dolomite also occurs beneath the Funeral Formation. This was observed also in parts of the Virginia Falls map area (Fig. 68). Presumably, the impermeable Funeral shale effectively confined aquifer flow to underlying strata, in a manner similar to the argillaceous Headless strata. Possibly, the coarsely crystalline dolomite facies of the Grizzly Bear Formation (Gabrielse et al., 1973), beneath the Funeral Formation in Glacier Lake map area, is genetically related to the Manetoe dolomite and perhaps should also be part of the Manetoe facies. Certainly this is the situation for the Grizzly Bear mapped in the northwest corner of the Virginia Falls map area (Douglas and Norris, 1976a). It is possible that the solution-collapse breccias scattered within the Arnica and Sombre formations also relate to development of a late Middle Devonian aquifer.

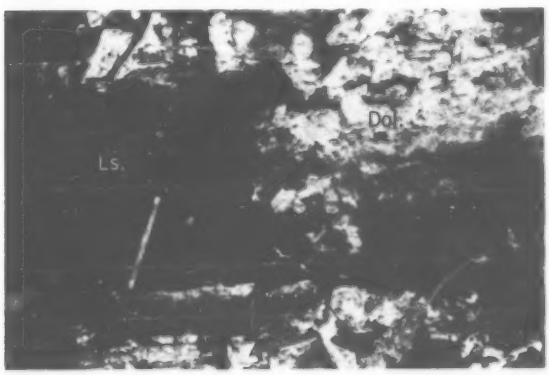


Figure 77. *A close-up view of an abrupt, but irregular, limestone-dolomite contact in a single bed in the Nahanni Formation. This exposure is near the base of the large dolomite mass shown in Figure 76. Three metres above the base of the Nahanni Formation in Section 45 (ISPG Photo No. 1420-14).*

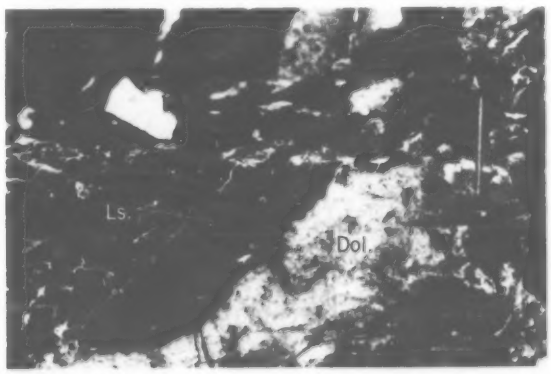


Figure 78. *A close-up view of a sharp, limestone-dolomite contact in a single bed in the Nahanni Formation. Dolomite extends up to the edge of a thin, calcite-filled fracture. This exposure is near the base of the large dolomite mass shown in Figure 76. 3.5 m above the base of the Nahanni Formation in Section 45 (ISPG Photo No. 1420-13).*

Other possible origins of the Manetoe facies dolomite could involve diagenesis by brine solution derived from the Middle to Late Devonian Elk Point Basin, or burial diagenesis by fluids derived from the overlying Late Devonian shale mass. Such fluids could have been introduced by downward movement through brecciated zones in the Nahanni.

Whatever the origin of the Manetoe dolomite it is clear that it is not a depositional entity but a diagenetic phenomenon, superimposed on the rocks of several formations, which are still recognizable in spite of the diagenetic overprint by the Manetoe dolomite. In view of this fact it is proposed that the Manetoe Formation be downgraded to the status of a facies which we have named the Manetoe facies (dolomite).

SUMMARY OF THE DEPOSITIONAL HISTORY AND IMPLICATIONS FOR EARLY PALEOZOIC TECTONICS AND EUSTASY

The Ordovician to Devonian sequence in the Virginia Falls and Sibbeston Lake map areas has been subdivided into four major groupings or assemblages, the Sunblood Platform, the Kindle-Root River assemblage, the Prairie Creek assemblage, and the Funeral-Headless assemblage. The last two assemblages have been further subdivided into two phases of sedimentation. The Prairie Creek assemblage contains an upper and a lower Cadillac phase, and the Funeral-Headless assemblage is composed of a lower Funeral-Landry phase and an upper Headless-Nahanni phase. These subdivisions record depositional intervals that were characterized by fixed, or slowly and uniformly migrating facies boundaries, and the subdivisions themselves are separated by thin stratigraphic intervals across which the distribution of lithofacies was profoundly altered.

It is difficult to separate the effects of local or regional tectonics and global eustatic sea level changes on the rock record, particularly where these agents are superimposed as in the Paleozoic sequence described here. It is certain, however, that the periods of transition between the various facies assemblages were caused by relatively abrupt tectonic or eustatic changes.

Climatic changes could also have a drastic influence on the character and distribution of facies belts. Climatic changes are, of course, caused by the interaction of a large number of variables, but secular changes of climate on the order of tens of millions of years may be related to the influence of two variables. One variable is the proportion of the earth's surface that is exposed, because of the disparity in heat conductivities of land areas versus marine areas. The other variable is the latitudinal position of a particular landmass (Ziegler et al., 1979). Recent work (Vail et al., 1977) has indicated that change in the shape of the world basins, related to sea floor spreading and associated orogenies, is the primary cause of long term eustatic sea level changes on the order of tens of millions of years. This, in turn, influences world climate because of the change in the relative proportions of sea and land due to eustatic sea level changes.

The latitudinal position of a given landmass on the earth's surface is of primary importance in determining its climate. The Virginia Falls and Sibbeston lake areas were part of the paleocontinental landmass, termed Laurentia, during the Ordovician and Silurian periods, and were part of the Laurussia landmass during the Devonian Period (Ziegler et al., 1979). Laurentia was essentially the North American continental landmass plus Greenland. The fusion of Laurentia with part of the Eurasian landmass (Baltica) in Devonian time formed the larger Laurussian paleocontinent. Paleogeographic reconstructions (Ziegler et al., 1979) incorporating these landmasses suggest that the Virginia Falls and Sibbeston Lake map areas were situated between 10 and 20 degrees north latitude throughout Ordovician and Silurian time, and at close to 30 degrees north latitude during Devonian time. The dominance of carbonate sedimentation in these areas during these periods is consistent with the paleolatitude determinations. It is also possible that the northward shift in the Laurussian landmass during Devonian time is reflected to some degree in the upward stratigraphic change, from the reddish evaporites and orange silty carbonates of the Early Devonian Camsell Formation, to the dull greenish grey and grey argillaceous limestones, characteristic of a more humid climate, of the Middle Devonian Headless and Nahanni formations.

A comparison of the lower Paleozoic stratigraphic sequence with the second order, Phanerozoic, sea level curve of Vail et al. (1977) shows several points of concurrence (Fig. 20). In general, sedimentation in the Virginia Falls area appears to have been largely continuous throughout Ordovician to Devonian time, but regional unconformities in correlative strata farther east toward the cratonic interior may reflect major periods of relative falls in sea level. During the Ordovician-Silurian rise in sea level, both the Sunblood Platform and the Kindle-Root River assemblages were deposited in the Virginia Falls area. Farther east along the Nahanni Range the Late Ordovician to Early Silurian Mount Kindle Formation rests unconformably on Early Ordovician strata of the Franklin Mountain Formation. This disconformity, representing Middle Ordovician time, extends throughout the interior plains and the Franklin Mountains, including the Nahanni Range in the Sibbeston Lake map area (Norford and Macqueen, 1975; Aitken and Cook, 1974; Meijer Drees, 1975a). In the Virginia Falls area, Middle Ordovician time is represented by the Sunblood Formation. It seems likely that the regionally extensive sub-Mount Kindle unconformity reflects the profound relative worldwide drop in sea level that occurred at the end of Early Ordovician time (Fig. 20). The following Middle to Late Ordovician rise in sea level was marked by deposition of the succession of shallow water shelf carbonates of the Sunblood and Mount Kindle formations, and the deeper water Esbataottine and Whittaker formations (Fig. 20). The shelf edge position of each of these probably was governed in part by the influence of the Redstone Arch and the Root Basin, as discussed by Ludvigsen (1975).

The rising Ordovician sea level coupled with abrupt subsidence of the Sunblood Platform formed the long-lived Meilleur River Embayment and the adjoining Root Basin. These paleodepressions were bordered by the coralline shelf sediments of the Mount Kindle Formation and partly infilled by the deeper water dolostones of the Whittaker Formation in Root Basin and by Road River shales in the Meilleur River Embayment (Fig. 4). In Late Ordovician and Early Silurian time deposition of the Road River shale spread into Root Basin through the Virginia Falls area.

The subsequent Early and Middle Silurian sea level rise coincided with deposition of the shelf carbonates of the Root River Formation around the east and west sides of Root Basin. This was followed by the Late Silurian sea level fall that exposed large areas of the present day Interior Plains to erosion, and formed the unconformity beneath the basal

detrital zone of the Bear Rock Formation in the Interior Plain (Law, 1971; Meijer Drees, 1975a). The clastic sediments eroded from this exposed region bypassed the Root River shelf carbonates and were shed into Root Basin. These sediments formed a westward sloping mudbank that partly filled pre-existing bathymetry and formed the lower part of the Cadillac Formation.

In the earliest Devonian, uplift occurred along the Sombre Salient and the southern depositional limit of the shallow neritic Vera Formation strata provides the first indication of the existence of Prairie Creek Embayment. Deposition of the Vera Formation may have coincided with the slight rise in sea level postulated by Vail et al. (1977) to have occurred at the Silurian-Devonian boundary (Fig. 20). This rise in sea level may have inundated land areas around Root Basin, causing a diminution in the supply of terrigenous material into the basin. The resumption of the Early Devonian falling sea level was accompanied by a renewal of the influx of terrigenous material into the Prairie Creek Embayment and deposition of the sandy dolostones of the Camsell Formation.

The embayment took its mature form with deposition of the Sombre and Arnica formations and the upper part of the Cadillac Formation during a rising sea level (Fig. 20). Throughout Early to Middle Devonian time the embayment was bounded on the east, north and west by large areas of peritidal, shelf carbonate deposition leading to the development of oligotrophic conditions and the deposition of the pink beds of the Cadillac within the embayment. The transition zone between shelf and offshore slope and basin deposits was stationary during this time, possibly indicating an underlying structural control for the shelf edge position. The Prairie Creek Embayment represents a stage in the evolution of the Root Basin in which Root Basin temporarily ceased to be a bathymetric feature. During this stage Root Basin was the site of shelf deposition.

Deposition of the Arnica on the shelf at the top of the Prairie Creek assemblage took place under more open marine conditions and the water in Prairie Creek Embayment became more normal marine. However, the rate of sediment supply to the embayment remained very low compared with the rate of sediment accumulation on the shelf around the embayment. Thus, the embayment could be characterized as a starved basin, particularly during deposition of the Upper Cadillac phase of the Prairie Creek assemblage.

After deposition of the Upper Cadillac phase, parts of the shelf, including large areas coinciding with Root Basin, subsided strongly, and argillaceous micropelletal limestones and shales of Funeral Formation accumulated in a reactivated Root Basin which extended as far north as the Dahadinni map area (Douglas and Norris, 1963; Douglas, 1976). Pelletal packstones of the Landry Formation accumulated on the shelf, in part contemporaneously with deposition of the Funeral Formation.

A short period of exposure and erosion probably occurred east of the Nahanni Range after or even during Landry deposition (Law, 1971) and this has been attributed to uplift of the Tathlina paleolandmass (Belyea, 1970). It is equally likely that a slight drop in sea level, which occurred in Middle Devonian time, was responsible for this episode of erosion. The argillaceous sediments destined for the Funeral Formation may have bypassed the shelf and have been deposited in Root Basin during this period of erosion. The subsequent rise in sea level was accompanied by deposition of the Headless-Nahanni phase and the coeval Hume Formation (Bassett, 1961) throughout the Mackenzie Mountains. The gently westward climbing facies contact between the Headless and Nahanni formations suggests that the Headless-Nahanni package prograded westward into uniformly deeper water, and there is little evidence to indicate that tectonic featues related to the Root River influenced deposition at this time. Following deposition of the Nahanni Formation, the entire Mackenzie Platform was submerged below wave base and the thick sequence of Upper Devonian shales was deposited on the former carbonate platform, thus ending early Paleozoic carbonate sedimentation on the Mackenzie Platform.

The maximum total thickness of the Paleozoic sequence examined in this study is about 3500 m in the region of Virginia Falls, representing strata ranging in age from Middle Ordovician to Middle Devonian, a time span of about 75 million years. This is an accumulation rate of 47 Bubnoff units (metres/million years), which is similar to subsidence rates at the outer regions of passive continental shelves, such as at the Atlantic continental margin, but less than that in many basinal settings at convergent plate margins (see Fischer, 1975).

CHAPTER V

SOME ASPECTS OF STRUCTURAL DEVELOPMENT

The report area displays two types of faults: steeply dipping reverse faults occurring primarily in the embayment area; and flatter thrust faults occurring primarily in rocks flanking the embayment. Both types have relatively minor folds related to them. The thrust faults postdate, in part at least, the reverse faults. The reverse faults cut rocks as old as Middle Ordovician Sunblood Formation, whereas the thrusts are not seen to cut strata older than Road River. The true width of Prairie Creek Embayment is unknown because both east and west sides have been overridden by shelf carbonates carried on the Tundra and Manetoe thrusts. Right-lateral displacements can be inferred and probably occurred in conjunction with regional compression.

Reverse faults

The area of Prairie Creek Embayment is cut by a number of steeply west-dipping, locally near vertical, reverse faults. They cut strata at a high angle, with local development of drag folds in both hanging wall and footwall (as at the north end of Gate Fault). Two unnamed faults, one on the east flank and the other on the north central part of the embayment, are cut off by Tundra Thrust and Manetoe Thrust respectively, clearly indicating that the latest movements on the reverse faults predate the latest movements on the thrusts. It is not understood why the reverse faults are restricted to the embayment area. They transect the entire sequence from Middle Ordovician Sunblood Formation to Upper Devonian Fort Simpson Formation.

Thrust faults

Prominent thrust faults in the report area are Arnica Thrust, Manetoe Thrust (both west dipping), and Tundra Thrust (east dipping). Lesser thrusts are North Headless Fault and South Headless Fault. Tundra and Manetoe thrusts occur on the east and west flanks respectively of Prairie Creek Embayment. Each juxtaposes hanging wall, shallow water, shelf carbonates against footwall deeper water embayment deposits. Transitional units, normally to be expected between shelf and deeper water sediments, are seen in only two places along the trace of Tundra Thrust; elsewhere, displacements on these thrusts appear to have been great enough that transitional facies have been completely overridden by the thrust plates. The main detachment level for thrusts in the report area is uncertain, but the oldest rocks seen in any of the thrusts belong to units of the Road River Formation and it is inferred that the incompetent shaly and argillaceous Road River Formation has localized a regional detachment. In the the case of Tundra and Manetoe thrusts, the ramps, along which the thrusts cut upward through post-Road River strata, appear to have been localized in, or close to, the facies change from shallow- to deep-water deposits. The inferred existence of a Road River detachment is problematical however, for although the detachment occurs on both sides of the embayment (as marked by Tundra and Manetoe thrusts) it does not occur in the embayment itself (cut only by the steeply dipping reverse faults). The implication is that another detachment deeper than the Sunblood Formation must underlie the region and that thrust faults, such as the Tundra and Manetoe, must cut down section to merge with the deeper detachment surface somewhere in the subsurface.

Wrench movements

Both reverse and thrust faults appear to have had some component of right-lateral horizontal movement. At the northern end of Gate Fault right-lateral displacement is suggested by the offset of the Nahanni Formation in the west limb of a syncline relative to the east limb. Relationships there could, however, readily be explained as due to erosion of a plunging anticline in the hanging wall. More compelling evidence for right-lateral wrench movements are a set of folds just north of South Nahanni River. They occur in a fault block bounded on the west by Manetoe Thrust and on the east by a reverse fault. These folds are oblique to the trend of the bounding faults and are readily explained as secondary folds related to wrench movements on either the unnamed reverse fault, or Manetoe Thrust, or both. Similarly, South Headless Fault terminates northward at a northwest trending anticline. The unusual trend of the anticline is compatible with right-lateral wrench movements on South Headless Fault.

Right-lateral wrench movements in the report area have previously been discussed by Cook (1977). If wrench displacements occurred they were not great and probably occurred in conjunction with Laramide compression rather than as a specific event.

ECONOMIC GEOLOGY

The Cadillac deposit is a relatively small but high grade lead-zinc and silver deposit (Fig. 81, in pocket) on Prairie Creek, and represents most of the known mineral potential in the report area. Extensive working of this deposit has shown the presence of an ore body containing more than 2 000 000 tons with a content of 12.5 per cent lead (galena) and 15.5 per cent zinc (sphalerite). The ore also contains 7 oz of silver per ton and minor percentages of other metals (copper, cadmium and tungsten) (Financial Post, 1980). The mineralization occurs in a near vertical, partly brecciated fracture zone that trends approximately north-south for several kilometres and is hosted in the Whittaker Formation. The bottom of the mineralized zone has not been reached.

TABLE 3

Lead isotope analyses of galena from the Cadillac deposit on Prairie Creek (Fig. 2)

Sample	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$
C-045670	19.001	15.661	39.019
C-045669	19.017	15.663	39.008
C-076296	19.025	15.675	39.056
C-076295	19.001	15.650	38.999
C-076294-1	19.022	15.663	39.017
C-076294-2	19.015	15.661	39.029
C-076299	19.011	15.662	39.038
10[1]	19.022	15.668	39.038
11[1]	19.017	15.667	39.044
12[1]	19.022	15.654	38.962
13[1]	19.027	15.666	39.037
14[1]	19.036	15.670	39.053
15[1]	19.028	15.663	39.015
17[1]	19.013	15.668	39.059
	19.020	15.663	39.026 - mean values

[1]Supplied by the staff of Cadillac Exploration Ltd.

Lead isotope determinations (Table 3) from twelve samples of Cadillac galena from scattered locations are extremely homogeneous and radiogenic and appear to fit the isochron of young silver-rich vein-type deposits of Godwin et al. (1979). This isochron was derived from other similar deposits in the Mackenzie Arch that apparently were mineralized about 60 million years ago during the Laramide Orogeny. Some of the metals in this deposit may have been derived from the Whittaker Formation itself, which is anomalously enriched in zinc (Table 2). However, the presence of a varied suite of metallic minerals, including scheelite, may indicate a primary hydrothermal source instead.

Some copper mineralization occurs at the south end of the Nahanni Range in a vertical zone of fracturing, of varying width, contained entirely within a large development of the light grey and white dolostone of the Manetoe facies, in and around the type section of the Nahanni Formation (Sec. 45). Subvertical mineralized fractures cut across the brecciated core of this Manetoe development and extend upward to the contact with the overlying Fort Simpson Formation. The downward extent of the fractures is not known, although they tend to become narrower downwards. The weathered gossan of this mineralized zone is largely limonite with some malachite. Black specks of a primary copper mineral, possibly tetrahedrite, were observed in some less weathered specimens. Other minerals may be present. Green malachite staining in the Manetoe facies dolomite was observed at several localities, including an occurrence in the type locality of the Manetoe facies at First Canyon. Localization of this type of mineralization in the Manetoe facies may be because of the greater lateral and vertical permeability of the facies compared to the enclosing strata. It may be that solutions derived from the overlying Fort Simpson shale mass, during late Paleozoic or early Mesozoic deep burial compaction, may have been responsible for this episode of mineralization.

Exploration for hydrocarbons is evidenced by numerous seismic lines across the Mackenzie Plain, the area between the Mackenzie and Nahanni mountains, and by the two exploratory wells, Pan Am Mattson Creek No. 1 and Texaco Ram Plateau N-44 (Appendix 3). Both of these wells were drilled on the flanks of regional anticlines but no significant hydrocarbons were found.

South of the study area, in the Fort Liard and La Biche River map areas (95B and C), three separate significant gas fields, the Beaver River, Kotaneelee and Pointed Mountain, occur in dolomitized Early and Middle Devonian strata equivalent to the Arnica, Landry, Headless, and Nahanni interval. Lower Paleozoic strata in this region south of the study area have a better potential for hydrocarbon discoveries, because the lower Paleozoic is buried uniformly beneath a cover of upper Paleozoic and Mesozoic rocks (Law, 1971). In the Virginia Falls and Sibbeston Lake map areas, erosion has exposed middle and lower Paleozoic rocks and many potential structural and stratigraphic traps, such as the Manetoe-Funeral facies boundary exposed along Ram Plateau, have been breached. There are however, a few untested localities in the study area that preserve the requirement of an adequate cover. The Twisted Mountain Anticline in the Sibbeston Lake map area is one region where Manetoe facies dolomite, if present, might be expected to be gas-bearing like that at Pointed Mountain. Another possible deeper target might be the Devonian strata buried beneath the Nahanni Thrust Fault. The Manetoe facies dolomite is a proven gas-bearing diagenetic facies that is extensively developed throughout these Lower and Middle Devonian platform carbonates and is not a reef facies confined to the shelf edge as earlier workers have assumed (e.g. Law, 1971).

It should be possible to recognize on seismic records any extensive masses of Manetoe facies dolomite in limestones of the Nahanni, Headless and Landry formations, because of the velocity difference between dolomite and limestone. This difference would be reversed if the dolomite is gas bearing.

Other, more speculative, Devonian targets could be subsurface occurrences of patch reefs or biostromes at the top of the Nahanni (similar to those exposed on Ram Plateau) or bituminous, crinoidal and coralline Arnica biostromes. However, as previously discussed, probably only in the Sibbeston Lake map area is the sedimentary cover suitable and thick enough to have entrapped hydrocarbons

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APPENDIX 1

TYPE SECTIONS AND SOME REFERENCE SECTIONS IN THE VIRGINIA FALLS MAP AREA

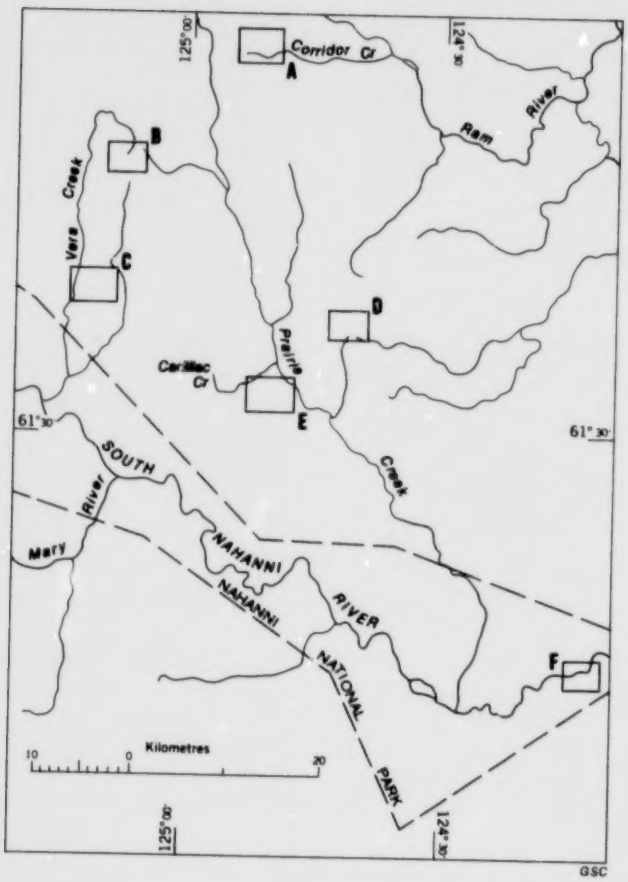

Figure 79. *Index map showing locations of air photo views of the type and reference sections illustrated in Figure 80.*

Figure 80. *Air photo views of type and reference sections described in Appendix 1. Symbols as on Figure 81 (legend). The location of all the photos in this figure are shown on Figure 79.*

A. *A portion of RCAF air photo A:17428-127, showing the location of Section 18 (Tundra Ridge Section) including the type sections of the Sombre Formation and the Corridor Member of the Camsell Formation. Corridor Creek is the eastward flowing tributary of Ram River immediately south of Section 18. North is toward the top of the page.*

B. *A portion of RCAF air photo A:17441-84 showing the location of Section 7 (Manetoe Range 1 Section), including the type section of the Vera Formation.*

C. *A portion of RCAF air photo A:17440-025 showing the location of Section 6 (South Manetoe 1 Section), including the type section of the detrital member of the Sombre Formation and a reference section for the pink shale member of the Cadillac Formation.*

D. *A portion of RCAF air photo A:17428-086 showing the location of Section 25 (South Tundra 7 Section), including a reference section for the Root River Formation.*

E. *A portion of RCAF air photo A:17428-020 showing the location of Section 11 (Prairie Creek 4 Section), including the type section of the Cadillac Formation.*

F. *A portion of RCAF air photo A:17440-163 showing the location of Section 40 (First Canyon Section), including the type section of the Arnica Formation and a reference section [type section of the Manetoe Formation of Douglas and Norris (1961)] for the Manetoe facies dolomite.*

lDc
lmDA
lmDF
lmD
lmDs3
lmDs1
A

lmDs3
lmDs2
lmDs1
mDF
B

Dm
lmD
6
lmDs
C

lmDF
lmDAb
Cm
SDc
Dm

lmDAb
SDc
12
lmDs
SRs

lmDA
lmDs
40
lmDA
Dm
P

Sombre Formation

The type section of the Sombre Formation (Douglas and Norris, 1961, p. 14) is contained in Section 18 (Lat. 61°58'N; Long. 124°54'W), as shown on figures 79 and 80A and graphically in Figure 47. It forms part of an east-west trending ridge, extending across the larger north-trending Tundra Ridge, and is underlain by the type section of the Corridor Member of the Camsell Formation.

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Sombre Formation (Conformably overlain by the Arnica Formation)		
75	Dolostone (90 per cent exposed): resistant, medium crystalline; light grey, grading upward to medium grey, weathering light to medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some small, medium to dark grey chert nodules oriented parallel to bedding; some solution-enlarged, slightly fractured, biogenic vugs (brachiopods?) floored with dark grey, geopetal carbonate silt and cemented with white, coarsely crystalline dolomite; basal contact gradational, continuous.	33.0 (108.3)	1101.5 (3613.8)
74	Dolostone:[1] resistant; finely crystalline; brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded; maximum thick bedded; most beds in this interval are brecciated, with white, coarsely crystalline dolomite as interfragment cement; some chert nodule bands in unbrecciated beds; basal contact gradational, continuous.	10.5 (34.4)	1068.5 (3504)
73	Dolostone (20 per cent exposed): slightly recessive; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; light grey beds of dolomite laminite alternate with thicker beds of dark brownish-grey, vuggy (biogenic porosity) and fetid dolomite; some breccia as in overlying beds; some silicified clasts; basal contact gradational, continuous.	33.0 (108.3)	1058.0 (3471.1)
72	Dolostone (40 per cent exposed): resistant; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; dark brownish-grey beds of vuggy, fetid dolomite grade upward into light grey dolomite laminites; a little breccia, cemented by white dolomite; basal contact gradational, continuous.	45.0 (147.6)	1025.0 (3362.9)
71	Dolostone (20 per cent exposed): slightly recessive; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; vuggy, brownish-grey dolomite alternating with light grey dolomite laminite, as in overlying interval, but proportion of dark dolomite is greater here; basal contact gradational, continuous.	24.0 (78.7)	980.0 (3215.2)
70	Dolostone: resistant; finely to very finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; dark brownish-grey dolomite and light grey laminite cycles as in overlying unit; some dark beds contain stromatoporoids and crinoids; dark beds overlie light grey beds across erosional contacts; basal contact gradational, continuous.	30.0 (98.4)	956.0 (3136.5)
69	Dolostone: resistant; finely to very finely crystalline; bedding planar, mode medium bedded; minimum thin bedded, maximum thick bedded; medium grey and brownish-grey dolomite beds alternate with light grey laminites; dark beds contain abundant vugs and partly leached amphiporids and thamnoporids and other corals; some "spaghetti rock" with leached amphiporids; basal contact gradational, continuous.	57.0 (187)	926.0 (3038.1)
68	Dolostone (95 per cent dolostone A; 5 per cent dolostone B) Dolostone A: resistant; finely crystal line; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium grey beds grade upward to thinner beds of light grey dolostone.		

[1]Exposure is complete unless otherwise stated.

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Dolostone B: recessive; finely crystalline; colour buff, light yellowish-grey weathering; bedding planar to wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded. A few beds of dolostone B occur near the top of the unit.		
	Basal contact gradational, continuous.	67.5 (221.5)	869.0 (2851)
67	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium- to dark-grey, vuggy dolostone grades upward to light grey, weakly laminated dolostone; darker grey beds tend to abruptly overlie light grey beds with some notably erosional contacts; vugs in dark beds are leached and solution-enlarged biogenic porosity; basal contact gradational, continuous.	45.0 (147.6)	801.5 (2629.6)
66	Dolostone (breccia): resistant; finely to very finely crystalline; light grey, weathering light grey; bedding planar; a non-bedded, chaotic, mud-supported dolostone breccia with little colour contrast between blocks and matrix; no sorting or grading of angular, light grey dolostone blocks, although there is a slight alignment parallel to bedding; blocks range from a few centimetres to a few metres in length; some fragments have long, thin apophyses projecting into the carbonate mud matrix; basal contact abrupt.	33.0 (108.3)	756.5 (2482)
65	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium- and dark-grey beds grade upward into light grey dolostone in cycles, as in some overlying units; basal contact gradational, continuous.	22.5 (73.8)	723.5 (2373.7)
64	Dolostone (80 per cent exposed: 95 per cent dolostone A; 5 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; interbedded medium- and light-grey dolostone as in overlying units; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded.		
	Dolostone B: recessive; very finely crystalline; impurities, silt; colour buff, weathering light yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; occurs as scattered interbeds mainly within lighter grey dolostone.		
	Basal contact gradational, continuous.	76.5 (251)	701.0 (2299.9)
63	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium- and light-grey dolostone as in overlying units, lighter grey intervals are relatively thin; basal contact gradational, continuous.	76.5 (251)	624.5 (2048.9)
62	Dolostone: resistant; finely crystalline; bedding planar, mode thick bedded, minimum thin bedded, maximum thick bedded; interbedded medium- and light-grey dolostone; abundant vugs in darker dolostone; dark dolostone beds commonly sharply overlie light coloured dolostone; basal contact gradational, continuous.	34.5 (113.2)	548.0 (1797.9)
61	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; light- and medium-grey dolostone interbedded; light grey dolomite laminite common, with many contorted laminae (algal mat overfolds?); basal contact gradational, continuous.	37.5 (123)	513.5 (1684.7)
60	Dolostone (breccia): resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium- and dark-grey dolostone breccia, appears to be a solution collapse breccia but original bedding is discernible; some chaotic breccia in pipes cemented with white dolomite, fragments tend to be rounded and are up to 50 cm long; basal contact abrupt.	21.0 (68.9)	476.0 (1561.7)
59	Dolostone (50 per cent exposed): slightly recessive; finely crystalline; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; medium grey, slightly vuggy dolostone grades upward into light grey dolostone; basal contact gradational, continuous.	27.0 (88.6)	455.0 (1492.8)
58	Dolostone (10 per cent exposed): recessive; finely crystalline; very dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; most of slope is covered with vegetation but there are some outcrops of bituminous biolithite containing abundant colonial rugose corals and stromatoporoids; basal contact gradational, continuous.	36.0 (118.1)	428.0 (1404.2)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
57	Dolostone (25 per cent exposed): recessive; finely crystalline; very dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; coral- and stromatoporoid-bearing dolomitized biolithite; units 57 and 58 together comprise the middle dark band of the Sombre Formation described by Douglas and Norris (1961, p. 14); basal contact gradational, continuous.	6.0 (19.7)	392.0 (1286.1)
56	Dolostone (25 per cent exposed): recessive; finely crystalline; dark grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; a dolomitized crinoidal wackestone with some leached biogenic porosity; basal contact gradational, continuous.	58.5 (191.9)	386.0 (1266.4)
55	Dolostone (80 per cent exposed): resistant; finely crystalline; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; medium grey beds grade upward into light grey laminite; darker beds contain small vugs; basal contact gradational, continuous.	47.0 (154.2)	327.5 (1074.5)
54	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; medium- to light-grey cycles; some scattered interbeds of light grey dolostone in medium grey beds; basal contact gradational, continuous.	30.0 (98.4)	280.5 (920.3)
53	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded light- and medium-grey dolostone; medium grey dolostone is full of small biogenic vugs; basal contact gradational, continuous.	33.0 (108.3)	250.5 (821.9)
52	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium- and light-grey dolostone as in overlying units; some thin, white dolostone beds are dolomitized, pisolitic grainstones containing good fenestral fabric; quartz silt abundant (<20%); basal contact gradational, continuous.	49.5 (162.4)	217.5 (713.6)
51	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium- and light-grey dolostone; some zones of thamnoporid-like corals and vugs in the thicker beds of darker dolostone; basal contact gradational, continuous.	30.0 (98.4)	168.0 (551.2)
50	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium-grey and light-grey dolostone; some stromatolitic undulations in the light grey dolomite laminite; basal contact gradational, continuous.	30.0 (98.4)	138.0 (452.8)
49	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium- and light-grey dolostone; corals in some thicker darker grey beds; basal contact gradational, continuous.	43.5 (142.7)	108.0 (354.3)
48	Dolostone (95 per cent exposed): resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded, featureless, medium-grey dolostone and light-grey dolomite laninite; basal contact abrupt.	64.5 (211.6)	64.5 (211.6)

Total thickness of the Sombre Formation is 1101.5 m (3613.8 ft).

(Conformably underlain by the Camsell Formation).

Note: The "total from base" values have been revised to start from zero at the base of the Sombre Formation. In Appendix 3, "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start from the base of the section, and not at the base of individual formations or members.

Corridor Member of the Camsell Formation (new name)

The type section of the Corridor Member of the Camsell Formation is also contained in Section 18 (Lat. 61°58'N; Long. 124°54'W), as shown on Figure 80A and graphically in Figure 15. The type section of the Corridor Member passes upward to the type section of the Sombre Formation. The Corridor Member is named after Corridor Creek in the valley south of the type section (Fig. 3).

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Camsell Formation (Corridor Member) (Conformably overlain by the Sombre Formation)		
47	Dolostone (95 per cent exposed: 90 per cent dolostone A; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; homogeneous, dark grey dolostone grades upward to light grey dolomite laninite; dark beds overlie light grey intervals on a sharp erosional contact.		
	Dolostone B: recessive; very finely crystalline; bedding planar to wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; this unit and most underlying ones have a pronounced striped appearance; interbeds of yellow weathering, buff dolostone with silty, argillaceous partings.		
	Basal contact absent.	97.5 (319.9)	914.0 (2998.7)
46	Dolostone (90 per cent dolostone A; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; more than 20 cycles in which dark, weakly laminated dolostone grades upward into light grey dolomite laminite; some laminae have been penecontemporaneously reworked into chip breccias with a carbonate mud matrix.		
	Dolostone B: recessive; finely crystalline; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; yellowish orange weathering, silty, buff dolostone that forms thin interbeds within dolostone A.		
	Basal contact abrupt.	96.0 (315)	816.5 (2678.8)
45	Dolostone (95 per cent) and limestone (5 per cent)		
	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; more than 20 cycles of dark grey dolostone grading upward into thinner intervals of light grey dolomite laminite; some of the light grey dolostone is yellowish grey.		
	Limestone: resistant; pelletal wackestone or packstone; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded. A single 3 m thick bed of weakly crossbedded limestone occurs in this unit.		
	Basal contact abrupt.	73.5 (241.1)	720.5 (2363.8)
44	Dolostone: moderately resistant; finely crystalline; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; greyish-yellow weathering; silty, with silt in fine laminae; basal contact gradational, continuous.	12.0 (39.4)	647.0 (2122.7)
43	Dolostone and limestone (80 per cent dolostone A; 10 per cent limestone; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 11 cycles of dark grey dolostone grading upward into light grey dolostone; dark dolostone is vuggy and slightly silicified.		
	Limestone: recessive; pelletal calcilutite; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; burrow mottled and slightly dolomitic.		

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; platy and silty.		
	Basal contact abrupt.	78.0 (255.9)	635.0 (2083.3)
42	Dolostone and limestone (75 per cent dolostone A; 15 per cent limestone; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 7 cycles of dark grey, vuggy dolostone grading upward into light grey dolomite laminite; vague corals and/or stromatoporoids in dark dolostone are slightly silicified.		
	Limestone: resistant; skeletal and pelletal packstone; medium- to light-grey, weathering light grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; partly dolomitized and silty; trough crossbedding is common with troughs up to 50 cm across; abundant skeletal debris in the sub-2 mm size fraction. Limestone occurs as 3 distinct beds in this unit.		
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode thin bedded, minimum medium bedded, maximum laminated; silt in seam and parting planes in this platy dolostone; dolostone B caps the unit and tends to separate cycles of dolostone A.		
	Basal contact abrupt.	61.5 (201.8)	557.0 (1827.4)
41	Dolostone (75 per cent) and limestone (25 per cent)		
	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; cycles of dark dolostone grading upward into light dolomite similar to those in overlying units.		
	Limestone: resistant; pelletal wackestone; medium grey, weathering light- to medium-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded. This limestone is restricted to a single 3 m thick interval that is vaguely laminated.		
	Basal contact abrupt.	34.5 (113.2)	495.5 (1625.7)
40	Dolostone (90 per cent dolostone A; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 6 cycles of dark- and light-grey dolostone similar to those in overlying units.		
	Dolostone B: recessive; finely crystalline; yellow to buff, weathering yellowish grey to yellowish orange; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; a very platy and silty dolostone, occurring as thin interbeds throughout the unit.		
	Basal contact abrupt.	42.0 (137.8)	461.0 (1512.5)
39	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 6 dark- and light-grey cycles similar to those in overlying units; some dark fetid beds are recognizably lenticular bioherms, about 20-30 m in width and 1 m thick with abundant, slightly silicified stromatoporoids and corals; basal contact abrupt.	27.0 (88.6)	419.0 (1374.7)
38	Dolostone (80 per cent exposed: 80 per cent dolostone A; 20 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 5 dark- and light-grey cycles similar to those in overlying units; dark dolostone is vuggy and biostromal; light dolostone is silty and calcareous with small vugs filled with an orange-coloured carbonate mineral.		
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar to lenticular, mode thin bedded, minimum laminated, maximum medium bedded; abundant laminae of fine sand and silt; mud cracks on some bedding surfaces.		
	Basal contact abrupt.	28.5 (93.5)	392.0 (1286.1)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
37	Dolostone (80 per cent dolostone A; 20 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; cycles of dark- to light-grey dolostone similar to those in overlying units.		
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; abundant silt and fine sand laminae.		
	Basal contact abrupt.	12.0 (39.4)	363.5 (1192.6)
36	Dolostone: slightly recessive; finely crystalline; yellow, weathering greyish yellow to yellowish orange; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; finely laminated with thin silt laminae; basal contact abrupt.	10.0 (32.8)	351.5 (1153.2)
35	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; intimately interbedded light- and dark-grey dolostone; basal contact abrupt.	9.0 (29.5)	341.5 (1120.4)
34	Dolostone (90 per cent dolostone A; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; cycles of dark grey dolostone grading upward into light grey dolostone.		
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; platy and silty.		
	Basal contact gradational, continuous.	42.0 (137.8)	332.5 (1090.9)
33	Limestone: resistant; pelletal grainstone and packstone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; slightly dolomitized and weakly crossbedded; basal contact abrupt.	2.0 (6.6)	290.5 (953.1)
32	Dolostone: slightly recessive; finely crystalline; yellow, weathering yellow; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; platy and silty; some polygonal mud cracks; basal contact abrupt.	9.0 (29.5)	288.5 (946.5)
31	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; cycles of dark grey dolostone grading upward into light grey dolostone; dark, vuggy dolostone rests on light grey dolostone with a sharp, erosional contact; some quartz silt; basal contact abrupt.	6.0 (19.7)	279.5 (917)
30	Dolostone: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar to wavy, mode medium bedded, minimum laminated, maximum medium bedded; weakly crossbedded with fine silt laminations; disseminated limonite causes orange and yellow stain; basal contact abrupt.	15.0 (49.2)	273.5 (897.3)
29	Dolostone (70 per cent dolostone A; 30 per cent dolostone B)		
	Dolostone A: slightly recessive; finely crystalline; yellow, weathering yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; silty and finely laminated, some crinkled laminae may be algal in origin; some mud cracks.		
	Dolostone B: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; medium- and light-grey dolostone; light grey dolostone is laminated.		
	Basal contact abrupt.	18.0 (59.1)	258.5 (848.1)
28	Dolostone: resistant; finely crystalline; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; light grey dolomite laminite and medium grey dolostone are interbedded; basal contact abrupt.	9.0 (29.5)	240.5 (789)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
27	Dolostone: recessive; finely crystalline; yellow, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; fine silt laminae are crinkled and may be partly algal in origin; basal contact gradational, continuous.	3.0 (9.8)	231.5 (759.5)
26	Dolostone (60 per cent dolostone A; 40 per cent dolostone B) Dolostone A: slightly recessive; finely crystalline; yellowish grey, weathering light yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; faintly laminated with quartz silt. Dolostone B: resistant; finely to medium crystalline; dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; biostromal, fetid dolostone containing abundant stromatoporoids (amphiporids) and corals; very vuggy. Basal contact gradational, continuous.	17.5 (57.4)	228.5 (749.7)
25	Dolostone (70 per cent dolostone A; 30 per cent dolostone B) Dolostone A: resistant; finely crystalline; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; cycles of dark grey dolostone grading upward into light grey dolomite laminite; stromatolites (algal biscuits) and shell layers in dark dolostone and many small vugs strung out parallel to bedding, some silicification of fossils. Dolostone B: recessive; finely crystalline; impurities; silt; yellow, weathering yellowish orange; bedding lenticular, mode laminated, minimum laminated, maximum very thin bedded; platy and silty with some isolated ripples. Basal contact gradational, continuous.	33.0 (108.3)	211.0 (692.3)
24	Dolostone (90 per cent) and limestone (10 per cent) Dolostone: resistant; finely crystalline; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; beds of dark grey, vuggy dolostone grading upward into yellowish-grey dolomite laminite. Limestone: resistant; pelletal and intraclast grainstone; medium grey, weathering medium- to light-grey; bedding planar to slightly wavy, mode thin bedded, minimum thin bedded, maximum thin bedded; smooth beds perhaps weakly crossbedded. Basal contact abrupt.	14.5 (47.6)	178.0 (584)
23	Dolostone (60 per cent dolostone A; 40 per cent dolostone B) Dolostone A: slightly recessive; finely crystalline; yellow, weathering yellowish grey to orange; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy; silty; finely laminated. Dolostone B: resistant; finely crystalline; yellowish grey to grey, weathering yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; faintly laminated; slightly silty. Basal contact gradational, continuous.	9.0 (29.5)	163.5 (536.4)
22	Dolostone: resistant; medium crystalline; dark brownish grey, weathering dark brown; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; a fetid and vuggy stromatoporoid and coral biolithite; some definite bioherms about 20 m in width and 1 m thick; some silicification of fossils; basal contact abrupt.	12.0 (39.4)	154.5 (506.9)
21	Dolostone: resistant; finely crystalline; light greyish yellow, weathering light yellow; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; laminated with a little ripple cross-stratification; one bed of peculiar, concave-upward, algal(?) laminations; basal contact gradational, continuous.	9.0 (29.5)	142.5 (467.5)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
20	Dolostone: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; weakly laminated; abundant small vugs after partly leached, articulated brachiopods; basal contact abrupt.	13.5 (44.3)	133.5 (438)
19	Dolostone: slightly recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; fine laminae of silt and fine sand; basal contact abrupt.	10.5 (34.4)	120.0 (393.7)
18	Dolostone (60 per cent dolostone A; 40 per cent dolostone B) Dolostone A: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; some wavy beds with brachiopod molds; some argillaceous material; grading upward into dolostone B. Dolostone B: moderately resistant; finely crystalline; yellowish grey, weathering greyish yellow; bedding planar, mode laminated, minimum very thin bedded, maximum very thin bedded; thinly laminated with some silty and argillaceous material. Basal co gradational, continuous.	15.0 (49.2)	109.5 (359.3)
17	Dolostone (60 per cent dolostone A; 40 per cent dolostone B) Dolostone A: slightly recessive; finely crystalline; yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; some silty and stromatolitic laminations. Dolostone B: resistant; finely to coarsely crystalline; dark greyish brown, weathering dark brown; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; fetid and vuggy stromatoporoid and coral biolithite; some bioherms as in overlying units, some amphiporid beds; fossils silicified; vugs occluded, with dogtooth quartz. Basal contact abrupt.	51.0 (167.3)	94.5 (310)
16	Limestone (65 per cent) and dolostone (35 per cent) Limestone: resistant; pelletal and intraclast packstone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded. Dolostone: moderately resistant; finely crystalline; buff, weathering yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; some beds finely laminated with silt laminae. Most of this dolostone lithology occurs at the top of the unit. Basal contact gradational, continuous.	30.0 (98.4)	43.5 (142.7)
15	Limestone (50 per cent limestone A; 50 per cent limestone B) Limestone A: slightly recessive; pelletal calcilutite; medium grey, weathering medium- to light-grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; laminated and platy with thin argillaceous partings. Limestone B: resistant; pelletal calcilutite; dark grey, weathering dark- to medium-grey; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; smooth to slightly lumpy bed surfaces; occurs interbedded with limestone A. Basal contact gradational, continuous.	7.5 (24.6)	13.5 (44.3)
14	Limestone: resistant; pelletal calcilutite; dark grey, weathering medium grey; bedding planar to wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; very homogeneous pelletal lime mudstone; basal contact gradational, continuous.	6.0 (19.7)	6.0 (19.7)
	Total thickness of the Corridor Member of the Camsell Formation is 914.0 m (2998.7 ft).		
	(The Camsell Formation is underlain conformably by the Vera Formation).		

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)

Note: The "total from base" values have been revised to start from zero at the base of the Corrider Member of the Camsell Formation. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section, and not at the base of individual formations or members.

Vera Formation (new name)

The type section of the Vera Formation is contained in Section 7 (Lat. 61°46'N; Long. 125°06'W) as shown on Figure 80B and graphically on Figure 12. The west-dipping strata of the type section are exposed on the east side of the Manetoe Range. The Vera Formation is named after Vera Creek on the west side of the Manetoe Range (Fig. 3).

	Vera Formation (Abrupt but conformably overlain by the Sombre Formation)		
6	Dolostone (40 per cent exposed): slightly recessive; finely crystalline; dark grey and brownish grey, weathering medium brownish grey with faint, yellow weathering argillaceous partings; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; stringers of crinoid fragments parallel to bedding; basal contact gradational, continuous.	75.0 (246.1)	271.5 (890.7)
5	Siltstone and limestone (60 per cent exposed: 70 per cent siltstone; 30 per cent limestone)		
	Siltstone: moderately recessive; calcareous; modal class silt, minimum class clay; dark brown, weathering medium brown; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; platy with dark brown argillaceous partings.		
	Limestone: moderately resistant; wackestone; dark grey, weathering medium yellowish brown and grey; bedding planar but uneven and tending to be crinkled in places, mode thin bedded, minimum very thin bedded, maximum thin bedded; some pockets of argillaceous material that weathers yellow; some skeletal debris (mainly brachiopods).		
	Basal contact gradational, continuous.	60.0 (196.9)	196.5 (644.7)
4	Limestone: moderately resistant; calcilutite; dark brownish grey, weathering medium- to light-brownish grey; bedding planar to slightly lenticular, mode very thin bedded, minimum laminated, maximum very thin bedded; silty and argillaceous with scattered brachiopods including *Orbiculoidea*; some yellowish brown, argillaceous partings; unit forms a bench in the side of the hill, basal contact gradational, continuous.		
	Fauna identified from GSC loc. C-059314 at 260 m includes:		
	Orbiculoidea sp. *Howellella*? sp. **age:** probably Early Silurian (Llandoverian) to Early Devonian (Lochkovian) (Report no. 1-AWN-1978, A.W. Norris).	69.0 (226.4)	136.5 (447.8)
3	Limestone: moderately resistant; wackestone; medium yellowish grey, weathering medium yellowish grey; bedding wavy to irregular, mode thin bedded, minimum very thin bedded, maximum thin bedded; some yellow, argillaceous partings rhythmically alternate with grey wackestone within beds; scattered crinoids and gastropods; basal contact gradational, continuous.	67.5 (221.5)	67.5 (221.5)
	Total thickness of the Vera Formation is 271.5 m (890.7 ft).		
	(Conformably underlain by and gradational into the Road River Formation).		

Note: The "total from base" values have been revised to start from zero at the base of the Vera Formation. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section, and not at the base of individual formations or members.

Detrital member of the Sombre Formation (new informal name)

The informal reference section for the detrital member of the Sombre Formation is contained in Section 6 (Lat. 61°38'N; Long. 125°10'W), as shown on figures 3 and 80C, and graphically on Figure 13. The west-dipping strata of the reference section are exposed on the east side of the southern extension of the Manetoe Range.

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Sombre Formation (detrital member) (Conformably overlain by the Funeral Formation)		
19	Limestone (80 per cent exposed): resistant; dolomitic wackestone; dark grey, weathering dark- to medium-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; crinoids (abundant *Gasterocoma bicaula*) and corals abundant; basal contact gradational, continuous.	10.5 (34.4)	350.0 (1148.3)
18	Dolostone (40 per cent exposed): resistant; finely crystalline; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant light grey millimetre-sized intraclasts; basal contact gradational, continuous.	62.0 (203.4)	339.5 (1113.8)
17	Limestone: resistant; fossiliferous packstone; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum thick bedded; crinoidal and intraclast packstone and grainstone mass flow deposits, but grading not evident; intraclasts 1-5 mm long; basal contact gradational, continuous.	51.0 (167.3)	277.5 (910.4)
16	Limestone and dolostone (80 per cent exposed: 90 per cent limestone; 10 per cent dolostone) Limestone: resistant; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum medium bedded, maximum thick bedded; grainstone beds containing abundant rounded intraclasts 1-5 mm long, intraclasts are crudely oriented parallel to bedding. Dolostone: resistant; finely crystalline; dark brownish grey, weathering medium brownish grey; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum thin bedded; some black chert nodules and partly silicified beds. Basal contact gradational, continuous.	40.0 (131.2)	226.5 (743)
15	Limestone: resistant; medium grey, weathering light grey; bedding planar and smooth, mode very thin bedded, minimum very thin bedded, maximum medium bedded; intraclast-bearing grainstone beds alternate with mudstone beds; a few scattered crinoids; basal contact gradational, continuous.	28.5 (93.5)	186.5 (611.9)
14	Limestone: resistant; medium grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; intraclast and crinoid grainstone and packstone; bases of individual beds are erosional with ripped-up platy clasts from the underlying beds, particularly of dark grey calcilutite beds that are scattered throughout the unit; basal contact gradational, continuous. Fauna identified from GSC loc. C-054358 at 651.0 m includes: ozarkodinan element, similar to the Pb element of *Pandorinellina exigua* (Philip) or *P. expansa* Uyeno and Mason **age:** Early Devonian (Pragian-Zlichovian boundary) to early Middle Devonian (*dehiscens* Zone to *costatus costatus* Zone)	39.0 (128)	158.0 (518.4)
13	Limestone: moderately resistant; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum thick bedded; intraclast and crinoid grainstones and wackestones; intraclasts and crinoids are oriented parallel to bedding; basal contact gradational, continuous.	18.0 (59)	119.0 (390.4)
12	Limestone: moderately resistant; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; graded beds of light grey intraclasts in darker grey lime mud; grains up to 1 cm long display preferential alignment parallel to bedding; basal contact gradational, continuous.	51.5 (169)	101.0 (331.4)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
11	Limestone: moderately resistant; dark- to medium-grey, weathering dark- to light-grey; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; a few beds of light grey intraclastic grainstone interspersed throughout dark grey wackestone beds some centimetre-sized fragments floating in a matrix of millimetre-sized grains (crinoids and brachiopod fragments; basal contact gradational, continuous.	49.5 (162.4)	49.5 (162.4)

Total thickness of the detrital member of the Sombre Formation is 350.0 m (1148.3 ft).

(Conformably underlain by the Cadillac Formation).

Note: The "total from base" values have been revised to start from zero at the base of the detrital member. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section, and not at the base of individual formations or members.

Root River

This incomplete reference section for the Root River Formation (Douglas and Norris, 1961, p. 7) is part of Section 25 (Lat. 61°37'N; Long. 124°43'W) as shown on figures 3 and 80D and graphically on Figure 15. The eastward dipping strata of this reference section form a steep west-facing escarpment that extends northward and merges with Tundra Ridge. The type section for the Root River Formation is in the Root River map area (Section 47).

	Root River Formation (Conformably overlain by the Camsell Formation)		
15	Dolostone: slightly recessive; finely crystalline; dark grey, weathering dark grey; bedding planar to uneven, mode medium bedded, minimum thin bedded, maximum medium bedded; a dolomitized lime mudstone; bedding thinner and more uneven toward the top of the unit; basal contact gradational, continuous.	58.5 (191.9)	517.0 (1696.2)
14	Dolostone: slightly resistant; finely crystalline; featureless; medium- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational.	21.0 (69)	458.5 (1504.3)
13	Dolostone: slightly recessive; finely crystalline; featureless; dark- to medium-grey, weathering medium- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational, continuous.	75.0 (246.1)	437.5 (1435.4)
12	Dolostone: resistant; finely crystalline; medium yellowish grey, weathering light grey to light yellowish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; some beds contain strings of small vugs (biogenic) parallel to bedding; basal contact gradational, continuous.	2.0 (6.6)	362.5 (1189.3)
11	Dolostone: resistant; cliff-forming; finely crystalline; dark- to medium-grey, weathering medium grey; uniformly planar, very thick bedded; abundant large robust *in situ* trimerellid-type brachiopods, many of which are partly leached and vuggy in places; bedding appears to be megalenticular.	33.0 (108.3)	360.5 (1182.7)
10	Dolostone: slightly recessive; finely crystalline; light yellowish grey to light grey, weathering light yellowish grey; bedding planar, uniformly medium bedded; biostromal, with abundant partly leached and recrystallized small finger corals and/or stromatoporoids strung out parallel to bedding; basal contact gradational, continuous.	73.5 (241.1)	327.5 (1074.5)
9	Dolostone: resistant; cliff-forming; finely crystalline; light- to dark-grey, weathering light- to dark-grey; uniformly very thick bedded; a few interbeds of dark grey, dolomitized brachipod packstones with fragmented brachiopods, in predominantly light grey vuggy beds with abundant *in situ* robust and partly leached trimerellid-like brachiopods (up to 20 cm long); basal contact gradational, continuous.	45.0 (147.6)	254.0 (833.3)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
8	Dolostone: slightly recessive; finely crystalline; light yellowish grey, weathering light yellowish grey to greyish yellow; mode medium bedded, minimum thin bedded, maximum medium bedded; several cycles (7 or 8) of large brachiopod-bearing beds grading upward into featureless, more yellow weathering dolostone; these brachiopodal beds exhibit some solution collapse breccia, most brachiopods have been leached, forming a very vuggy rock; basal contact gradational, continuous.	36.0 (118.1)	209.0 (685.7)
7	Dolostone: resistant; finely crystalline; medium grey, weathering medium- to light-grey; bedding planar, uniformly very thick bedded; large, robust, trimerellid brachiopods are abundant and appear to be mainly *in situ*, most are leached, leaving large vugs; brachiopod shell material tends to weather orange; basal contact gradational, continuous. Fauna identified from GSC loc. C-59399 at 165.0 m and includes: cf. ***Trimerella ohioensis*** Meek **age:** Niagaran (Middle Silurian) (Report no. 1-AWN-1978, A.W. Norris).	18.0 (59.1)	173.0 (567.6)
6	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; very vuggy dolostone with abundant partly or completely leached brachiopods (trimerellid-like) strung out parallel to bedding; some small (5 m in width by 3 m high) mounds of packed, leached brachiopods are scattered throughout and have undergone some solution-collapse brecciation; basal contact gradational, continuous.	27.0 (88.6)	155.0 (508.5)
5	Dolostone: resistant; finely crystalline; abundant leached trimerellid-type brachiopods form a very vuggy, reef-like dolostone; where biogenic vugs (up to 20 cm long) are particularly abundant there is some solution-collapse breccia cemented with white dolomite; basal contact gradational, continuous.	30.0 (98.4)	128.0 (419.9)
4	Dolostone: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; mode thick bedded, minimum medium bedded, maximum very thick bedded; light grey, vuggy, very thick bedded intervals containing *in situ* brachiopods are interbedded with dark, slightly petroliferous, skeletal wackestone containing brachiopods, corals, crinoids, and gastropods; basal contact gradational, continuous.	12.5 (41)	98.0 (321.5)
3	Dolostone: moderately resistant; finely crystalline; dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; prolific fauna in dark grey petroliferous dolomitized skeletal wackestone with abraded brachiopods, gastropods and crinoids, some corals and hemispheroidal stromatoporoids?; some interbeds of thick light grey vuggy dolostone; basal contact gradational, continuous.	48.0 (157.5)	85.5 (280.5)
2	Dolostone: moderately resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant fasciculate, colonial corals in thicker, light grey beds with some solution-collapse breccia, darker grey beds are less fossiliferous; basal contact gradational, continuous.	15.0 (49.2)	37.5 (123)
1	Dolostone: moderately resistant; finely crystalline; featureless; light- to medium-grey, weathering light grey with some pink mottling; bedding smooth, mode thin bedded, minimum very thin bedded, maximum medium bedded; basal contact abrupt at the Tundra Thrust Fault.	22.5 (73.8)	22.5 (73.8)

Incomplete thickness of the Root River Formation is 517.0 m (1696.2 ft).

Cadillac Formation (new name)

The type section for the Cadillac Formation is contained in Section 11 (Lat. 61°33'N; Long. 124°47'W) as shown on Figure 80E and graphically on Figure 13. The west-dipping strata of this section extend along a west trending ridge east of Prairie Creek. The Cadillac Formation is named after Cadillac Creek immediately north of the type section (Fig. 3).

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Cadillac Formation (Conformably overlain by the basinal member of the Arnica Formation)		
22	Siltstone (70 per cent exposed): recessive; calcareous; dark brown and grey, weathering greyish pink; mainly detrital dolomitic siltstone with limonite coated grains; quartz a minor constituent; modal class silt, minimum class clay, maximum 5 per cent 0.10 mm; bedding planar to lenticular, thin bedded; small scale crossbedding forms lenticularly bedded intervals; basal contact abrupt.	36.0 (118.1)	993.0 (3257.9)
21	Dolostone and siltstone (90 per cent exposed: 85 per cent dolostone; 15 per cent siltstone) Dolostone: resistant; finely crystalline; dark grey, weathering dark- to medium-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; a dolomitized calcilutite or calcisiltite; vague laminations and some graded couplets suggest that there may be mass flow deposits; strongly silicified. Siltstone: recessive; dolomitic; dark brown, weathering reddish pink (mixture of limonite and hematite in matrix); quartz only a minor constituent, detrital dolomite silts forms 80-90 per cent of the rock; bedding planar; minimum class clay, modal class silt, maximum 5 per cent 0.01 mm; mode laminated, minimum laminated, maximum laminated. Several one metre thick intervals of siltstone and scattered throughout this unit. Basal contact abrupt.	117.0 (383.9)	957.0 (3139.8)
20	Siltstone (95 per cent exposed): slightly resistant; dolomite cemented; modal class silt, minimum class clay, maximum 5 per cent 0.1 mm; medium- to dark-brown, weathering yellow and pink; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; impure quartzarenite and detrital dolomicrite fragment; limonite disseminated throughout matrix; a few thick, resistant beds of fine grained sandstone, that have erosional lower contacts, are scattered within the unit; thicker siltstone beds are finely colour laminated and contain pyrite nodules; a few small, lenticular, partially silicified, coralline carbonate bodies scattered throughout (bioherms?); basal contact abrupt.	88.5 (290.4)	840.0 (2755.9)
19	Limestone (80 per cent exposed): moderately resistant; skeletal intraclast packstone and wackestone; medium- to dark-grey, weathering medium grey to yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; graded beds of fragmental brachiopods, crinoids, corals (*Coenites*?) and lime mudclasts, grade upward into light grey calcisiltite; clasts oriented parallel to bedding; some yellowish-orange, argillaceous silt between beds; some black chert nodules near the top of the unit; basal contact abrupt.	10.5 (34.4)	751.5 (2465.5)
18	Siltstone (20 per cent exposed): recessive; dolomite cemented and platy; medium brown, weathering light yellowish brown; quartz silt less than 90 per cent; a few microcline grains, but mostly detrital dolomite grains rimmed with limonite; modal class silt, minimum class clay, maximum 5 per cent 0.50 mm; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; some white sandstone beds with eroded bases and load casts (turbidites?), these beds are commonly graded from medium to fine quartzarenite sand; a few rippled sandstone lenses in the siltstone; basal contact gradational, continuous.	39.0 (128)	741.0 (2431.1)
17	Shale (40 per cent exposed): recessive; silty and fissile; medium brown to brownish grey weathering light brownish orange; some distinct grains of limonite and some disseminated limonite in matrix; quartz less than 90 per cent; modal class silt, minimum class clay, maximum 5 per cent 0.05 mm; bedding planar, mode laminated, minimum thinly laminated, maximum very thin bedded; thicker siltstone beds contain disarticulated detrital brachiopod shells; basal contact gradational, continuous.	30.0 (98.4)	702.0 (2303.1)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
16	Sandstone and limestone (60 per cent exposed: 80 per cent sandstone; 20 per cent limestone)		
	Sandstone: moderately resistant; medium greyish brown, weathering yellowish brown; quartz more than 90 per cent; more feldspar than lithic clasts; bedding planar to weakly lenticular, modal class fine sand, minimum class silt, maximum 5 per cent 0.20 mm; bedding mode laminated, minimum thinly laminated, maximum very thin bedded; many beds of siltstone rather than fine sandstone; some brachiopods on siltstone bed surfaces.		
	Limestone: resistant calcisiltite; medium- to dark-grey, weathering yellowish brown to grey; bedding wavy, mode very thin bedded, minimum laminated, maximum very thin bedded; some admixture of yellow-weathering, argillaceous material between grains; abundant atrypid-like brachiopods; some graded beds may be mass flow deposits; basal contact gradational, continuous.	12.0 (39.4)	672.0 (2204.7)
15	Siltstone and limestone (75 per cent exposed: 90 per cent siltstone; 10 per cent limestone)		
	Siltstone: moderately resistant; dolomitic; medium- to light-brown, weathering light orange yellow; sorting fair, rou ing and sphericity poor; modal class silt, minimum class clay; quartz less than 90 per cent; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy to flaggy parting.		
	Limestone: resistant; skeletal wackestone; dark grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; beds of skeletal debris (crinoids, brachiopods and coral fragments) grade upward into weakly laminated calcilutite or calcisiltite.		
	Limestone beds occur as individual interbeds within the siltstone; basal contact gradational, continuous.	105.0 (344.5)	660.0 (2165.4)
14	Siltstone and limestone (70 per cent exposed: 80 per cent siltstone; 20 per cent limestone)		
	Siltstone: moderately resistant; dolomitic with micropellets of dolomite (0.04 mm) abundant; medium brown, weathering light orange-yellow; sorting fair, rounded and sphericity poor; quartz less than 90 per cent; modal class silt, minimum class clay, maximum 5 per cent 0.14 mm; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy to flaggy parting.		
	Limestone: resistant; skeletal wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; beds of coral, crinoid and brachiopod fragments grade upward into faintly laminated calcisiltite or calcilutite; orange-weathering argillaceous material occurs between the grains.		
	Unit occurs over a prominent rise and then along a bench; basal contact gradational, continuous.	150.0 (492.1)	555.0 (1820.9)
13	Siltstone (80 per cent exposed): moderately resistant; dolomitic; light grey and greyish brown, weathering orange to yellowish orange; sorting fair, rounding and sphericity poor; quartz less than 90 per cent; modal class silt, minimum class clay, maximum 5 per cent 0.14 mm; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy parting; unit occurs along a prominent topographic bench; basal contact gradational, continuous.	90.0 (295.3)	405.0 (1328.7)
12	Limestone: resistant; calcilutite; medium grey, weathering greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; argillaceous and platy; some monograptid-like graptolites on bed surfaces; basal contact gradational, continuous.	20.0 (65.6)	315.0 (1033.5)
11	Siltstone (70 per cent) and limestone (30 per cent)		
	Siltstone: resistant; dolomite with some silty dolostone; yellowish brown to orange, weathering yellowish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy parting with some ripple marks.		

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Limestone: resistant; skeletal wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; some graded beds with skeletal debris grading upward from abundant brachiopod and crinoid fragments into vaguely laminated calcilutite; yellow, argillaceous material occurs in the matrix between clasts.		
	Basal contact abrupt.	15.0 (49.2)	295.0 (967.8)
10	Siltstone and limestone (80 per cent exposed: 65 per cent siltstone; 35 per cent limestone)		
	Siltstone: moderately resistant; dolomitic; abundant micropellets of dolomicrite (0.04 mm); brown to orange, weathering yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy parting.		
	Limestone: resistant; skeletal wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; graded debris flows of coral and crinoid material occur in groups throughout the unit.		
	Unit is exposed up a prominent rise; basal contact gradational, continuous.	155.0 (503.5)	280.0 (918.6)
9	Siltstone (70 per cent exposed): moderately recessive; dolomitic, some silty dolomicrite with micropellets of dolomicrite (0.04 mm); light grey, weathering orange (limonitic); bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; thicker beds tend to be fine grained sandstone; platy to flaggy parting; unit is exposed along a topographic bench; basal contact abrupt.	90.0 (295.3)	125.0 (410.1)
8	Limestone: resistant; argillaceous calcilutite; medium yellowish grey, weathering medium to light greyish yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; slightly silty; some monograptid-like graptolites; unit is exposed along a cliff; basal contact gradational, continuous.	20.0 (65.6)	35.0 (114.8)
7	Dolostone (70 per cent) and limestone (30 per cent)		
	Dolostone: resistant and silty; yellowish brown, weathering medium reddish orange; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; many beds are dolomitic siltstone; platy parting.		
	Limestone: resistant; calcilutites; medium- to dark-grey, weathering medium grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; some calcilutite beds contain brachiopod and crinoid fragments and an admixture of silty, yellow, argillaceous material.		
	Unit is exposed up a steep rise; basal contact abrupt.	15.0 (49.2)	15.0 (49.2)
	The total thicknes of the Cadillac Formation is 993.0 m (3257.9 ft).		
	(Conformably underlain by the Road River Formation).		
	Note: The "total from base" values have been revised to start from zero at the base of the Cadillac Formation. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section, and not at the base of individual formations or members.		

Basinal member of the Arnica Formation (new informal name)

The reference section for the basinal member of the Arnica Formation is part of Section 13 (Lat. 61°28'N; Long. 124°50'W; and Fig. 3). The west-dipping strata of this section form a low hill about 16 km north of Second Canyon on the South Nahanni River.

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Arnica Formation (basinal member) (Abruptly but conformably overlain by the Funeral Formation)		
11	Limestone and dolostone (40 per cent exposed: 85 per cent limestone; 15 per cent dolostone)		
	Limestone: moderately resistant; calcilutite and wackestone; dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; most of this limestone is silicified; some crosslaminations are present, which may indicate that some of this limestone is a calcarenite; these beds are weakly graded; some coarsely fragmental fossiliferous (crinoids, corals), intraclast-bearing, wackestone mass flow deposits are also present.		
	Dolostone: silty; recessive; finely crystalline; brownish red to yellowish brown, weathering pink to brownish yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; slightly argillaceous and platy; occurs as thin intervals interbedded with silicified limestone.		
	Basal contact gradational, continuous.	33.0 (108.3)	93.0 (305.1)
10	Limestone (50 per cent exposed: 80 per cent limestone A; 20 per cent limestone B)		
	Limestone A: moderately resistant; fossiliferous wackestone; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; graded beds of crinoid and intraclast (rounded lime mud fragments) wackestone that are irregularly silicified; some conglomeratic beds with rounded calcilutite fragments up to 20 cm long, fragments oriented parallel to bedding.		
	Limestone B: moderately resistant; calcirudite; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; conglomeratic, almost a breccia, with many coarse calcilutite fragments in a recrystallized matrix of packstone containing abundant skeletal debris, including crinoids and brachiopod fragments; some silicification.		
	Basal contact gradational, continuous.	13.5 (44.3)	60.0 (196.8)
9	Limestone (50 per cent exposed): slighly recessive; wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium and light grey calcarenite beds grade upward to dark grey calcilutite; some patchy areas of silicification; basal contact gradational, continuous.	15.0 (49.2)	46.5 (152.6)
8	Dolostone (40 per cent exposed): slightly resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; appears to be a partly silicified and dolomitized calcarenite; some silicified wackestone; silicification appears to outline some small scale crossbedding; basal contact abrupt.		
	Fauna identified from GSC loc. C-052993 at 30 m includes:		
	Pandorinellina exigua philipi (Klapper) **age:** Early Devonian, Pragian-Zlichovian boundary, *dehiscens* Zone (Report no. 8-TTU-1979)	13.5 (44.3)	31.5 (103.3)
7	Dolostone (40 per cent exposed): slightly resistant; finely crystalline; dark grey to brownish grey, weathering medium grey and brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; laminated, dolomitized wackestone or calcilutite with thin, lenticular, black chert bands; basal contact abrupt.		
	This unit and the overlying units of the dark siliceous member of the Arnica Formation are poorly exposed on a dip slope leading down to the Funeral contact.	9.0 (29.5)	18.0 (59.1)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
6	Dolostone: resistant; finely crystalline; dark to light greyish-brown, fresh and weathered colour; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; dolomite laminite with some scattered ostracodes (laminites may be calcilutite turbidite deposits); several laminite beds have detached to form disharmonic slump folds that are cored with breccia cemented by white dolomite; black chert masses are also brecciated; basal contact abrupt.	9.0 (29.5)	9.0 (29.5)
	Total thickness of the basinal member of the Arnica Formation is 93.0 m (305.1 ft).		
	(Conformably underlain by the Cadillac Formation).		
	Note: The "total from base" values have been revised to start from zero at the base of the basinal member. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section and not at the base of individual formations or members.		

Arnica Formation

The type section for the Arnica Formation (Douglas and Norris, 1961, p. 7) is contained in Section 40 (Lat. 61°17'N; Long. 124°14'W) as shown on Figure 80F and on Figure 3. The nearly horizontal strata of this section form the south side of First Canyon on the South Nahanni River. A brief description of the overlying Landry Formation is included before the description of the Arnica.

The reference section for the Manetoe facies also occurs in Section 40. This was previously the type section for the Manetoe Formation (Douglas and Norris, 1961), but in this report the Manetoe Formation has been reduced to the status of a diagenetic facies, superimposed on both Landry and Arnica strata.

	Landry Formation (Conformably overlain by the Headless Formation)		
26	Limestone (50 per cent) and dolostone (50 per cent)		
	Limestone: resistant; pelletal wackestone; medium brownish grey, weathering medium- to light-grey; bedding planar and very smooth, mode thick bedded, minimum thin bedded, maximum very thick bedded; very little skeletal material, perhaps a few ostracodes and gastropods.		
	Dolostone: moderately resistant; coarsely crystalline; white, weathering light grey to white; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded. The dolostone occurs intimately interbedded with limestone and is in fact a dolomite replacement of Landry limestone and part of the Manetoe facies.		
	Basal contact abrupt.	54.0 (177.2)	54.0 (177.2)
	Total thickness of the Landry Formation is 54.0 m (177.2 ft).		

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Arnica Formation (Abruptly but conformably overlain by the Landry Formation)		
25	Dolostone: resistant; medium to coarsely crystalline; dark grey, weathering dark- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded (1 to 15 m thick); massive and vuggy with abundant stromatactis-like pores filled with coarsely crystalline white dolomite (Manetoe facies); dark grey host dolostone is fetid; some cavernous solution vugs filled with white dolomite; some "zebra" texture near top of unit where white dolomite has invaded along bedding planes; chunks of the dark reef rock may have fallen in caverns in the underlying unit that were later infilled and cemented by white dolomite; basal contact gradational.		
	This unit is part of the Manetoe facies dolomite.	19.0 (62.3)	625.5 (2052.2)
24	Dolostone: resistant; coarsely crystalline; white, weathering light grey to white; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; entire unit is a cavern fill of coarsely crystalline white dolomite (Manetoe facies); a weakly crossbedded, light orange weathering zone of detrital dolomite silt and sand occurs at the erosional base of the cavern fill and some blocks of dark grey reef rock have fallen to the base of the cavern from the overlying unit; some malachite nodules occur within the white cave-filling dolomite; basal contact erosional.		
	This unit crosses a saddle and is correlative with the white dolomite of a nearby butte, and is part of the Manetoe facies dolomite.	12.0 (39.4)	606.5 (1989.8)
23	Dolostone: resistant; medium crystalline; dark grey, weathering dark- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; stromatactis-bearing, fetid dolostone as in underlying units; basal contact gradational, continuous.	15.0 (49.2)	594.5 (1950.5)
22	Dolostone: resistant; medium crystalline; medium grey to brownish grey, weathering medium brownish grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; several beds containing abundant stromatactis; several beds with abundant amphiporids and brachiopods; some zones of leached fossil material have undergone solution-collapse; basal contact gradational, continuous.	27.0 (88.6)	579.5 (1901.2)
21	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; some good stromatactis fabric, some geopetal, and some zones of solution-collapse breccia; basal contact gradational, continuous.	15.0 (49.2)	552.5 (1812.7)
20	Dolostone (80 per cent exposed): moderately resistant; finely crystalline; light to medium brownish grey, weathering light brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; thicker, medium brownish grey beds alternate with light grey beds; some fenestral fabric in light grey beds and some zones of authigenic quartz with crystals up to 3 cm in length, crystals oriented randomly in the plane of bedding; basal contact gradational, continuous.	30.0 (98.4)	537.5 (1763.5)
19	Dolostone (80 per cent exposed): moderately resistant; finely crystalline; light to medium brownish grey, weathering light brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; similar to overlying unit but no light grey beds with fenestral fabric observed; basal contact gradational, continuous.	54.5 (178.8)	507.5 (1665)
18	Dolostone (50 per cent exposed): most of this unit is covered with vegetation; some thick bedded light brownish grey dolostone as in underlying unit; basal contact gradational, continuous.	66.0 (216.5)	453.0 (1486.2)
17	Dolostone (90 per cent dolostone A; 10 per cent dolostone B)		
	Dolostone A: resistant; finely crystalline; light to dark brownish grey, weathering light to dark brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; many vuggy beds with several brecciated beds of solution-collapse breccia cemented with white dolomite.		

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Dolostone B: moderately resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; faintly laminated; occurs as interbeds within dolostone.		
	Basal contact gradational, continuous.	30.0 (98.4)	387.0 (1269.7)
16	Dolostone: resistant; finely crystalline; medium to dark brownish grey, weathering medium to dark brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thick burrow-mottled dark beds grade upward to lighter thin beds; some vugs filled with white dolomite and quartz; basal contact gradational, continuous.	48.0 (157.5)	357.0 (1171.3)
15	Dolostone: resistant; finely crystalline; dark grey and brownish grey, weathering dark grey and brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thick burrow-mottled and amphiporid-bearing beds grade upward to thin beds; some brecciated horizons with solution-collapse breccias, vugs filled with dolomite and calcite spar; basal contact gradational, continuous.	30.0 (98.4)	309.0 (1013.8)
14	Dolostone: as in overlying unit; some broad low amplitude (10 cm) wave-like bed forms in thick beds; thinner, light grey beds are laminated and contain algal mat overfolds; basal contact gradational, continuous.	30.0 (98.4)	279.0 (915.4)
13	Dolostone: resistant; finely crystalline; medium to dark greyish brown, weathering medium to dark greyish brown; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; well-exposed cycles of burrowed vuggy dark dolostone with rippled bases and lighter, more recessive laminite tops; thicker burrowed beds have knobbly bed partings; rippled intervals have a discernible relict, sand-sized, intraclast texture (originally grainstone?); basal contact gradational, continuous.	30.0 (98.4)	249.0 (816.9)
12	Dolostone: resistant; finely crystalline; medium grey and brownish grey, weathering medium grey and brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; thinner beds are lighter grey and laminated, some laminations are contorted, thicker beds are darker and mottled.	39.0 (128)	219.0 (718.5)
11	Dolostone (75 per cent exposed): moderately resistant; medium crystalline; medium to dark grey and brownish grey, weathering medium to dark brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some vuggy and fossiliferous bands and some limonitized pyrite streaks; minor solution-collapse brecciation throughout; basal contact gradational, continuous.	30.0 (98.4)	180.0 (590.5)
10	Dolostone: resistant; finely crystalline; medium to dark brownish grey, weathering medium to dark brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some scattered intervals of light grey laminite; basal contact gradational, continuous.	37.5 (123)	150.0 (492.1)
9	Dolostone: resistant; finely crystalline; dark to medium brownish grey, weathering dark to medium brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; thicker beds are darker brownish grey and slightly vuggy; several intervals of light grey dolomite laminite with needle quartz; basal contact gradational, continuous.	30.0 (98.4)	112.5 (369.1)
8	Dolostone: resistant; finely crystalline; dark to medium brownish grey, weathering dark to medium brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; similar to overlying unit but some good stromatactis fabric in a few of the thicker beds; basal contact gradational, continuous.	30.0 (98.4)	82.5 (270.7)
7	Dolostone: resistant; finely crystalline; dark to medium brownish grey, weathering dark to medium brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; abundant amphiporids and leached amphiporids in some thicker beds; base of thick beds tend to be rippled; many thick beds are capped with a thin bed of light grey to white pisolitic grainstone with fenestral fabric; dark beds have erosional basal contact where they overlie light grey beds; basal contact gradational, continuous.	15.0 (49.2)	52.5 (172.2)
6	Dolostone: as in the overlying unit, but only two light grey intervals; basal contact gradational, continuous.	21.0 (68.9)	37.5 (123)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
5	Dolostone: resistant; finely crystalline; dark brownish grey, weathering dark to medium brownish grey with thin white bands; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; dark beds grade upward to light grey beds with fenestral fabric and quartz needles in the plane of bedding; light grey or white beds appear to be pisolitic and contain good fenestral fabric; some rip-up clasts of white dolomite occur at the base of dark thicker beds that overlie the light grey beds; abundant amphiporids in some dark beds; basal contact gradational, continuous.	16.5 (54.1)	16.5 (54.1)

Total thickness of the Arnica Formation is 625.5 m (2052.2 ft).

(Conformably underlain by the Sombre Formation).

Note: The "total from base" values have been revised to start from zero to the base of the Arnica Formation. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section and not at the base of individual formations or members.

Headless Formation

A reference section of the Headless Formation (Douglas and Norris, 1961) is designated in this report to be part of Section 39 (Lat. 61°45'N; Long. 124°25W) at the north end of Ram Plateau (figs. 3, 70). The horizontal strata of this section form part of the northernmost spur of Ram Plateau.

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
	Headless Formation (Conformably overlain by the Nahanni Formation)		
14	Limestone (10 per cent exposed): slightly argillaceous and fossiliferous wackestone; dark grey to greenish grey, weathering medium- to dark-grey and greenish grey; bedding nodular, mode thin bedded, minimum thin bedded, maximum medium bedded; brachiopods and other skeletal debris scattered throughout; horn corals, *Coenites*: curved, green, argillaceous seams; basal contact abrupt.	52.5 (172.2)	213.0 (698.8)
13	Shale (50 per cent exposed): recessive; modal class clay, minimum class clay, maximum 5 per cent 0.02 mm; medium grey, weathering yellow; sorting not determined, rounding and spehericity not determined, matrix more than 2 per cent; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; platy, very calcareous shale; almost an argillaceous limestone; similar to limestone and shale of the Funeral Formation; basal contact abrupt.	72.0 (236.2)	160.5 (526.6)
12	Covered interval mainly (10 per cent exposed): limestone; recessive; argillaceous wackestone; medium- to dark-grey and greenish grey, weathering same; bedding nodular, mode thin bedded, minimum very thin bedded, maximum thin bedded; fossiliferous with brachiopods, pelecypods, echinoderm fragments, and an indeterminate skeletal hash with some charophytes; some fossils appear to be silicified; some skeletal grainstone stringers with fragments cemented by iron-rich calcite; greenish wisps of argillaceous material are common; basal contact gradational, continuous. In GSC loc. C-052967, at 436 m, the identified fauna includes: *Atrypa* sp. "*Carinatina*" sp. *Emanuella* sp. *Warrenella* sp. *Nowakia* sp. *Tentaculites* sp. pelecypods bryozoan echinoderms **age:** Eifelian, early Middle Devonian A.W. Norris, Report no. 1-AWN-1976) and; *Polygnathus parawebbi* Chatterton **age:** Middle Devonian; Eifelian – mid-Givetian (Report no. 8-TTU-1979).	27.0 (88.6)	88.5 (290.4)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
11	Covered interval (5 per cent exposed): lithology exposed similar to unit 10; basal contact gradational, continuous.	40.5 (132.9)	61.5 (201.8)
10	Covered interval mainly (10 per cent exposed): limestone; recessive; argillaceous wackestone; pellets; medium- to dark-grey and greenish grey, weathering medium grey, greenish grey and orange; bedding wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; curved, green, argillaceous seams weather orange; scattered brachiopods; basal contact gradational, continuous.	21.0 (68.9)	21.0 (68.9)
	Total thickness of the Headless Formation is 213.0 m (698.8 ft).		
	(Conformably underlain by the Funeral Formation).		
	Note: The "total from base" values have been revised to start from zero at the base of the Headless Formation. In Appendix 3 the "total from base" values start from zero at the base of the section. In both appendices 1 and 3, unit numbers start at the base of the section and not at the base of the individual formations or members.		

Funeral Formation

The type section of the Funeral Formation is a nearly horizontal section that extends southeastward up the northwest side of Ram Plateau in the northeast part of the Virginia Falls map area (95F) in the Northwest Territories. The section begins at Lat. 61°44'25"N; Long. 124°28'W, and forms part of Section 35 (figs. 3, 70).

	Funeral Formation (Conformably underlies the Headless Formation)		
9	Limestone: argillaceous; yellow weathering unit slightly more resistant than underlying unit; platy, very thin bedded lime mudstone similar to unit 5.	12.0 (39.4)	228.0 (748)
8	Limestone: argillaceous; moderately resistant bench; dark grey; thin bedded argillaceous lime wackestone; planar bedded and platy in lower part but grades upward to irregular, thin, lumpy bedded, orange mottled crinoidal wackestone toward the top of the unit (similarly to the Headless Formation); many beds have smooth bases but irregular, colour mottled upper surfaces.	28.5 (93.5)	216.0 (708.7)
7	Limestone: argillaceous; prominent yellow weathering cliff; very thin, planar bedded argillaceous lime mudstones similar to unit 5, but also some more argillaceous lenticular bedded intervals.	21.0 (68.9)	187.5 (615.2)
6	Shale and limestone		
	Shale: calcareous.		
	Limestone: argillaceous; recessive; yellow, bench-forming unit between cliffs; similar to unit 4.	13.5 (44.3)	166.5 (546.3)
5	Limestone: argillaceous; resistant; yellow, prominent cliff-former of very thin bedded, platy, dark grey lime mudstone with yellow argillaceous partings; some pyritized fauna on bed surfaces.	15.0 (49.2)	153.0 (502)
4	Shale and limestone		
	Shale: calcareous.		
	Limestone: argillaceous; recessive; yellow weathering, bench-forming unit; very thin to laminated; lenticular, platy bedding in dark grey lime mudstone with yellow, argillaceous partings, and yellow calcareous shale; orthoconic cephalopods, crinconarids and brachiopod *Lingula* occur on some bed surfaces.	22.5 (73.8)	138.0 (452.8)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
3	Limestone: argillaceous; resistant; bright yellow cliff-former; very thin, planar, smooth bedded (3 cm thick), yellow weathering, dark grey lime mudstone with pyrite and a few orthoconic cephalopods (10 cm long) on some bed surfaces; argillaceous bed partings.	31.5 (103.3)	115.5 (378.9)
2	Limestone and shale (20 per cent exposed): recessive; yellowish grey weathering covered unit that forms the slope extending up to the overlying cliff-forming unit; platy, laminated, lime mudstone with yellow, argillaceous partings; bedding slightly lenticular with discontinuous silty laminae; some pyritized orthoconic cephalopods and small brachiopods on bed surfaces; very soft, greyish yellow, calcareous shale in covered intervals.	84.0 (275.6)	84.0 (275.6)
	Total thickness of the Funeral Formation is 228.0 m (748 ft).		
	(Conformably overlies the Arnica Formation).		

Funeral Formation

This reference section of the Funeral Formation is on the west side of a north-trending valley at the north end of Ram Plateau and is included in the Ram Plateau 1 section (Section 39) at Lat. 61°45'N; Long. 124°25'W (Fig. 3).

	Funeral Formation (Conformably underlies the Headless Formation)		
9	Limestone and shale (15 per cent exposed): similar to unit 8; basal contact gradational, continuous.	105.0 (344.5)	354.0 (1161.4)
8	Limestone (90 per cent) and shale (10 per cent)		
	Limestone: resistant; argillaceous calcilutite; dark grey, weathering medium yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; thin beds are less yellow weathering than the very thin beds; abundant sapropel.		
	Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; medium- to dark-grey, weathering medium yellow; sorting good, rounding and sphericity angular; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; platy weathering and calcareous.		
	Crude cycles of thin bedded limestone grading upward to platy shale; sapropelic; basal contact gradational, continuous.	54.0 (177.2)	249.0 (816.9)
7	Limestone: argillaceous calcilutute; medium- to dark-grey, weathering medium greyish yellow to yellowish orange; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; argillaceous material concentrated along partings; some disseminated pyrite and sapropelic; basal contact gradational, continuous.	18.0 (59.1)	195.0 (639.8)
6	Limestone (90 per cent) and shale (10 per cent)		
	Limestone: argillaceous calcilutite; medium- to dark-grey, weathering yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; argillaceous material concentrated along bed partings, some disseminated pyrite and sapropel.		
	Shale: modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; medium brownish grey, weathering medium to light yellow; sorting good, rounding and sphericity angular; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; a calcareous shale with argillaceous material concentrated along partings.		
	Shale and limestone interbedded in intervals less than 1 m thick.		
	Basal contact gradational, continuous.	31.5 (103.3)	177.0 (580.7)

Unit	Description	Unit Thickness m (ft)	Total from base m (ft)
5	Shale (50 per cent) and limestone (50 per cent) Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; dark grey, weathering medium- to light-yellow; sorting not determined; rounding and sphericity angular; matrix more than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; a calcareous shale with argillaceous material concentrated along partings, sapropelic. Limestone: resistant; argillaceous calcilutite; dark grey, weathering yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded. Interbedded with calcareous shale in interbeds less than 1 m thick; some disseminated pyrite and sapropelic. Basal contact gradational, continuous.	28.5 (93.5)	145.5 (477.4)
4	Shale (70 per cent) and limestone (30 per cent) Shale: slighly recessive; modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; medium yellowish grey to grey, weathering yellow; sorting good, rounding and sphericity angular; matrix more than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; sapropelic with abundant pyrite, argillaceous partings; some current lineations (azimuth 135°, plunge 0°). Limestone: argillaceous cacilutite; dark- to medium-grey, weathering yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; sapropelic, with some quartz silt; argillaceous partings, occurs as thin intervals in a shale dominated unit. Basal contact gradational, continuous.	30.0 (98.4)	117.0 (383.9)
3	Shale (60 per cent) and limestone (40 per cent) Shale: slightly recesssive; modal class clay, minimum class clay, maximum 5 per cent 0.02 mm; medium- to dark-grey, weathering yellow; sorting not determined, rounding and sphericity angular; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; sapropelic and pyritic; some pyritized fish fragments; some vague current lineations on bed surfaces; abundant detrital quartz silt. Limestone: argillaceous calcilutite; medium- to dark-grey, weathering yellow; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; some small, dark grey chert nodules; somewhat sapropelic and pyritic. Thin intervals less than 2 m thick with interbedded shale and limestone. Basal contact gradational, continuous.	30.0 (98.4)	87.0 (285.4)
2	Limestone (80 per cent exposed): argillaceous calcilutite; dark grey, weathering medium yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; shaly bed partings; syngenetic pyrite outline small scale contortions in millimetre thick laminae; up to 20 per cent detrital quartz silt; basal contact gradational, continuous.	30.0 (98.4)	57.0 (187)
1	Limestone (80 per cent exposed): argillaceous calcilutite; dark grey, weathering yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; sapropelic and pyritic; abundant quartz silt; basal contact gradational, continuous.	27.0 (88.6)	27.0 (88.6)
	Incomplete thickness of the Funeral Formation is 354.0 m (1161.4 ft). (Base of section is a few metres above a conformable contact with the Arnica Formation).		

APPENDIX 2

PALEONTOLOGY

Fauna Data

APPENDIX 2

PALEONTOLOGY

The faunal data included here are derived both from measured sections and from isolated outcrop localities. This appendix is divided into two parts to reflect their different sources of information. The first part includes faunal determinations from measured stratigraphic sections whereas the second part is comprised solely of faunal determinations from isolated outcrops. Within each part, faunal determinations are grouped primarily by formation to facilitate estimation of the overall age control pertaining to any given formation. Lithologic data pertaining to samples from measured sections are given with the section descriptions in Appendix 3.

The major faunal groups identified in this study include graptolites (identified by B.S. Norford) conodonts (identified by T.T. Uyeno) trilobites and brachiopods (identified by A.W. Norris and R. Ludvigsen) and corals (identified by A.E.H. Pedder). Faunal zones are those given in Jackson et al. (1978), Ludvigsen (1975), Klapper and Johnson (1980), Crickmay (1960), Noble and Ferguson (1971) and Pedder (1975). Additional information concerning these faunal identifications may be obtained from the authors and from the individual paleontologists who identified these faunas.

PART I

SELECTED FAUNAL DETERMINATIONS FROM SECTIONS

(Collected by D.W. Morrow)
(Grouped by formation)

Formation and Height Above Base (Below Top)	Section No. and Height Above Base of Section in Metres	Locality, Fauna and Age	GSC Loc. No. and Paleontologist
Whittaker (1.0)	1A-8.5	63°32'15"N, 124°51'W - Whittaker 1 Section (95K) *Calyptaulax callirachis* (Cooper) *Ceraurinella kingstoni* Chatterton and Ludvigsen *Bumastoides lenzi* Chatterton and Ludvigsen *Cybeloides cimelia* Chatterton and Ludvigsen *Nanillaenus* cf. *mackenziensis* Chatterton and Ludvigsen *Spaerexochus* sp. age: Middle Ordovician - late Chazyan (*Ceraurinella nahanniensis* Zone)	C-097565 R. Ludvigsen
Whittaker (51.0)	1A-58.5	62°32'15"N, 124°51'W - Whittaker 1 Section (95K) *Bathyurus* sp. bryozoans indet. age: Middle Ordovician - Chazyan to Black-riveran	C-097568 R. Ludvigsen
Whittaker (249.5)	1A-257.0	62°32'15"N, 124°51'W - Whittaker 1 Section (95K) *Tricopelta mackenziensis* Ludvigsen and Chatterton *Ceraurinella brevispina* Ludvigsen *Borealaspis* sp. (hypostome only) *Ceraurinus serratus* Ludvigsen *Bumastoides* cf. *mackenziensis* Ludvigsen age: Late Ordovician - Edenian (*Ceraurus mackenziensis* Zone)	C-097571 R. Ludvigsen
Whittaker (0.5)	3A-379.0	61°43'N, 125°56'W - Esbataottine Section (95F) *Glyptorthis* sp. *Hesperorthis australis* Cooper *Zygospira* sp. *Holtedahlina* sp. rhynchonellid indet. bryozoans small rugose corals age: Middle Ordovician - Rocklandian or Kirk-fieldian	C-097594 R. Ludvigsen
Esbataottine (48.0)	3A-181.5	61°43'N, 125°56'W - Esbataottine Section (95F) *Ceraurinella nahanniensis* Chat-terton and Ludvigsen *Nanillaenus aduncus* Chatterton and Ludvigsen *Sphaerexochus arenosus* Chatter-ton and Ludvigsen *Cybeloides cimelia* Chatterton and Ludvigsen *Remopleurides pattersoni* Chat-terton and Ludvigsen *Calyptaulax callirachis* (Cooper) *Bumastoides lenzi* Chatterton and Ludvigsen *Apianurus* sp. *Isotelus* sp. *Failleana calva* Chatterton and Ludvigsen age: Middle Ordovician - late Chazyan (*Ceraurinella nahanniensis* Zone)	C-097583 R. Ludvigsen
Esbataottine (113.5)	3A-247.0	61°43'N, 125°56'W - Esbataottine Section (95F) *Ceraurus gabrielsi* Ludvigsen *Calyptaulax* cf. *strasburgensis* (Cooper)	C-097587 R. Ludvigsen
		Failleana sp. *Cybeloides cimelia* Chatterton and Ludvigsen *Isotelus* sp. *Bumastoides* sp. *Doleroides* sp. *Rostricellula* sp. *Oepikina* cf. *speciosa* Cooper age: Middle Ordovician - Blackriveran (*Ceraurus gabrielsi* Zone)	
Esbataottine (220.0)	3A-353.5	61°43'N, 125°56'W - Esbataottine Section (95F) *Anataphrus* cf. *borraeus* Whittington *Ceratocephala* cf. *triacantheis* Whittington and Evitt *Sphaerexochus atacius* Ludvigsen *Cybeloides cimelia* Chatterton and Ludvigsen *Bumastoides* sp. *Calyptaulax* sp. *Ceraurinella arctica* Ludvigsen *Skenidioides* cf. *anthonensis* (Sardeson) *Zygospira* sp. *Doleroides* sp. *Oepikina* cf. *speciosa* Cooper *Strophomena* sp. *Sowerbyella variabilis* Cooper age: Middle Ordovician - late Blackriveran or Rocklandian (*Ceraurinella longispina* Zone)	C-097592 R. Ludvigsen
Esbataottine (99.0)	4A-165.0	61°31'N, 125°44'W - Sunblood Section (95F) *Cybeloides cimelia* Chatterton and Ludvigsen *Isotelus parvirugosus* Chatterton and Ludvigsen *Calyptaulax* cf. *strasburgensis* (Cooper) *Strophomena* sp. age: Middle Ordovician, probably Blackriveran	C-097604 R. Ludvigsen
Esbataottine (182.5)	4A-248.5	61°31'N, 125°44'W - Sunblood Section (95F) *Ceraurinella longispina* Ludvigsen *Tetraphalerella* cf. *basilica* (Cooper) *Oepikina* cf. *speciosa* Cooper *Hesperorthis* sp. age: Middle Ordovician, late Blackriveran or Rock-landian (*Ceraurinella longispina* Zone)	C-097607 R. Ludvigsen
Sunblood (115.5)	3A-18.0	61°43'N, 125°56'W - Esbataottine Section (95F) *Bathyurus granulosus* Ludvigsen ostracodes indet. age: Middle Ordovician, early or middle Chazyan (*Bathyurus granulosus* Zone)	C-097576 R. Ludvigsen
Road River (226.5)	1-170.0	61°42'N, 125°38'W - Cathedral Mountain 1 Section (95F) cf. *Schizophoria paraprima* Johnson, Boucot and Murphy cf. *Spirigerina marginaliformis* Alekseeva cf. *Atrypa neiczlawiensis* Kozlowski age: early Lochkovian (early Early Devonian)	C-057797 A.W. Norris
Road River (105.5)	6-64.0	61°38'N, 125°10'W - South Manetoe 1 Section (95F) *Ozarkodina remscheidensis remscheidensis* (Ziegler) age: late Late Silurian - early Early Devonian (*delta* Zone)	C-059338 T.T. Uyeno
Road River 146.5	12-273.0	61°32'N, 126°47'W - Prairie Creek 7 Section (95F) straight cephalopod *Monograptus* sp. age: Silurian	C-059233 B.S. Norford
Road River (168.0)	10-0.0	61°37'N, 126°53'W - Funeral Range 1 Section (95F) *Monograptus* ex gr. *M. spiralis* (Geinitz)? age: if a graptolite, Early Silurian (latest Llandovery), *M. spiralis* Zone	C-059263 B.S. Norford

Formation and Height Above Base (Below Top)	Section No. and Height Above Base of Section in Metres	Locality, Fauna and Age	GSC Loc. No. and Paleontologist
Road River (121.0)	10-47.0	61°37'N, 126°53'W - Funeral Range 1 Section (95F) *Monograptus* cf. ex gr. *M. priodon* (Bronn) age: Early Silurian (late Llandovery to Wenlock)	C-059265 B.S. Norford
Road River (35.0)	10-133.0	61°37'N, 126°53'W - Funeral Range 1 Section (95F) *Cyrtograptus* sp. *Monograptus* ex gr. *M. priodon* (Bronn) *M.* aff. *M. vomerinus* (Nicholson) *M.* sp. *Retiolites* (?) sp. age: Early Silurian (latest Llandovery to Wenlock)	C-059271 B.S. Norford
Road River (18.0)	10-150.0	61°37'N, 126°53'W - Funeral Range 1 Section (95F) *Monograptus* spp. *M.* ex gr. *M. priodon* (Bronn) age: Early Silurian (late Llandovery to Wenlock)	C-059272 B.S. Norford
Road River (65.0)	24-30.0	61°39'N, 126°43'W - South Tundra 6 Section (95F) conulariid *Monograptus* sp. age: Silurian	C-059295 B.S. Norford
Road River 167.0	11-455.0	61°33'N, 126°47'W - Prairie Creek 4 Section (95F) *Cyrtograptus* sp. *Monograptus* ? sp. age: Early Silurian (latest Llandovery to Wenlock)	C-057865 B.S. Norford
Cadillac 62.0	10-230.0	61°37'N, 126°53'W - Funeral Range 1 Section (95F) *Monograptus* 2 spp. *M. bohemicus*, cf. *M. bohemicus tenuis* Boucek age: Late Silurian, late Ludlow	C-059275 B.S. Norford
Cadillac (pink shale mbr) 290.0	5-408.5	61°34'N, 125°12'W - South Manetoe 2 Section (95F) *Nowakia* ? sp. *Stylolina* ? sp. age: Late Silurian to Late Devonian	C-057778 B.S. Norford
Cadillac (pink shale mbr) 291.5	5-410.0	61°34'N, 125°12'W - South Manetoe 2 Section (95F) *Nowakia* sp. *Monograptus yukonensis* Jackson and Lenz age: Early Devonian, Pragian, *M. yukonensis* Zone	C-057779 B.S. Norford
Cadillac (pink shale mbr) (46.0)	13-95.0	61°28'N, 126°50'W - West Headless Section (95F) *Icriodus* cf. *I. steinachensis* Al Rawi beta morphotype *Panderodus* sp. age: probably Early Devonian [*I. steinachensis* has been reported from the *sulcatus* and *kindlei* Zones of late Lochkovian to Pragian age, in Nevada (Klapper and Johnson, 1980)]	C-052984 T.T. Uyeno
Cadillac (pink shale mbr) (45.0)	13-96.0	61°28'N, 126°50'W - West Headless Section (95F) *Pandorinellina exigua philipi* (Klapper) *Icriodus* ? sp. *Belodella* sp. *Panderodus* sp. age: Early Devonian; Lochkovian Pragian boundary to Zlichovian, *sulcatus* to *gronbergi* Zones	C-052985 T.T. Uyeno
Cadillac (pink shale mbr) 280.5	6-450.0	61°38'N, 125°10'W - South Manetoe 1 Section (95F) *Eognathodus sulcatus kindlei* Lane and Ormiston *Pandorinellina optima* (Moskalenko) age: Early Devonian; Pragian, *kindlei* Zone	C-059351 T.T. Uyeno
Cadillac 344.5	24-460.0	61°30'N, 126°43'W - South Tundra 6 Section (95F) *Orbiculoidea* sp. *Howellella*? sp. brachiopod fragments echinoderm fragments conulariid octracodes	C-059306 A.W. Norris
		fucoidal markings ages: probably Early Silurian (Llandoverian) to Early Devonian (Lochkovian)	
Cadillac 257.0	10-425.0	61°37'N, 126°53'W - Funeral Range 1 Section (95F) *Atrypa* sp. cf. *A. nieczlawiensis* Kozlowski *Howellella*? sp. *Ancillotoechia* sp. echinoderm ossicle age: probably Lochkovian (Early Devonian)	C-059281 A.W. Norris
Cadillac no base or top	26-17.0	61°34'N, 126°44'W - Cadillac Section (95F) *Stylopleura* sp. *Atrypa* sp. cf. *A. nieczlawiensis* Kozlowski *Ancillotoechia*? sp. echinoderm ossicles age: probably Lochkovian (Early Devonian)	C-057714 A.W. Norris
Cadillac 186.0	24-301.5	61°39'N, 126°43'W - South Tundra 6 Section (95F) cf. *Rhipidium* sp. age: Wenlockian or Ludlovian (late Early or early Late Silurian)	C-059302 A.W. Norris
Cadillac 74.0	23-230.0	61°39'N, 126°44'W - South Tundra 8 Section (95F) Cyathaspididae, gen. et. sp. indet. (fish plate fragments) age: probably Ludlovian or Pridolian of the Silurian	C-059243 A.W. Norris
Cadillac (48.0)	22-12.0	61°44'N, 126°46'W - South Tundra 1 Section (95F) *Coenites* sp. *Leptaena* sp. cf. *Gorgostrophia* sp. *Salopina* sp. *Atrypa* sp. *Spinatrypa* sp. *Howellella* sp. *Machaeraria* sp. gastropod ostracodes pelecypod echinoderm fragments *Warburgella rugulosa* (Alth) n. subsp. age: early Lochkovian, early Early Devonian	C-052706-1 A.W. Norris
Cadillac (48.0)	22-12.0	61°44'N, 126°46'W - South Tundra 1 Section (95F) *Ozarkodina remscheidensis remscheidensis* (Ziegler) *O.* probably n. sp. *Pedavis pesavis* n. subsp. A of Klapper and Philip (1972) age: Early Devonian, *delta* Zone	C-052706-2 T.T. Uyeno
Vera (17.5)	18-109.0	61°52'N, 126°54'W - Tundra Ridge Section (95F) *Aulopora* sp. *Coenites* sp. *Gorgostrophia*? sp. high spired gastropod age: probably Early Devonian	C-052607 A.W. Norris
Vera (237.5)	3-30.0	61°42'N, 126°16'W - Arnica Ridge 2 Section (95F) *Coenites rectilineatus* (Simpson) *Schizophoria paraprima* Johnson, Boucot and Murphy cf. *Spirigerina* sp. *Atrypa nieczlawiensis* Kozlowski brachiopod ages: early Lochkovian (early Early Devonian)	C-057661 A.W. Norris
Vera (167.5)	3-100.0	61°42'N, 126°16'W - Arnica Ridge 2 Section (95F) *Coenites rectilineatus* (Simpson) *Iridistrophia* sp. cf. *I. umbella* (Barrande) age: probably early Lochkovian (early Early Devonian)	C-057664 A.W. Norris
Vera (130.0)	16-158.0	61°58'N, 126°56'W - North Tundra 1 Section (95F) *Iridistrophia* sp. *Mesodouvillina*? sp. *Schizophoria* sp. cf. *S. paraprima* Johnson, Boucot and Murphy age: Lochkovian (early Early Devonian)	C-057824 A.W. Norris

Formation and Height Above Base (Below Top)	Section No. and Height Above Base of Section in Metres	Locality, Fauna and Age	GSC Loc. No. and Paleontologist
Vera 77.5	1-475.0	61°42'N, 125°38'W - Cathedral Mountain I Section (95F) *Spirigerina* sp. *Ancillotoechia* sp. bryozoans echinoderm fragments age: Lochkovian (early Early Devonian)	C-057800 A.W. Norris
Vera 134.0	7-260.0	61°46'N, 125°06'W - Manetoe Range I Section (95F) *Orbiculoidea* sp. *Howellella*? sp. age: probably Early Silurian (Llandoverian) to Early Devonian (Lochkovian)	C-059314 A.W. Norris
Vera 52.0	22-112.0	61°44'N, 124°46'W - South Tundra I Section (95F) *Ozarkodina* sp. [possibly *O. remscheidensis remscheidensis* (Ziegler)] *Panderodus* sp. age: possibly Early Devonian	C-052708 T.T. Uyeno
Vera 79.0	47-1068.0	62°47'45"N, 125°16'W - Pastel Creek Section (95K) *Ozarkodina remscheidensis remscheidensis* (Ziegler) age: late Pridolian to early Lochkovian	C-083166 T.T. Uyeno
Vera 78.0	22-138.0	61°44'N, 124°46'W - South Tundra I Section (95F) *Ozarkodina remscheidensis remscheidensis* (Ziegler) age: late Pridolian to early Lochkovian	C-052709 T.T. Uyeno
Sombre (detrital mbr) 147.0	6-651.0	61°38'N, 125°10'W - South Manetoe I Section (95F) ozarkodinan element, similar to the Pb element of *Pandorinellina exigua* (Philip) or *P. expansa* Uyeno and Mason age: probably Early Devonian to early Middle Devonian	C-059358 T.T. Uyeno
Arnica (basinal mbr) 30.0	13-171.0	61°28'N, 124°50'W - West Headless Section (95F) *Pandorinellina exigua philipi* (Klapper) age: Early Devonian, Lochkovian-Pragian boundary to Zlichovian, *sulcatus* to *gronbergi* Zones	C-052993 T.T. Uyeno
Root River (352.0)	25-165.0	61°37'N, 124°43'W - South Tundra 7 Section (95F) cf. *Trimerella ohioensis* Meek age: Niagaran (previously Middle Silurian)	C-059399 A.W. Norris
Sombre 944.5	22-1871.0	61°44'N, 124°46'W - South Tundra I Section (95F) *Pandorinellina exigua* (Philip) *Polygnathus dehiscens* Philip and Jackson age: Early Devonian, Pragian-Zlichovian boundary to Zlichovian, *dehiscens* to *gronbergi* Zones	C-052746 T.T. Uyeno
Arnica 174.0	32-665.0	61°18'N, 124°30'W - Second Canyon I Section (95F) *Icriodus culicellus* (Bultynck) (long form) age: late Emsian - early Couvinian, but the long form is more characteristic of late Emsian (Em3)	C-052835 T.T. Uyeno
Arnica (181.5)	38-90.0	61°40'N, 124°27'W - Sundog Creek I Section (95F) a single fragmentary spathognathodontan element [possibly Pa element of ?*Pandorinellina exigua* (Philip)] age: possibly Early-Middle Devonian	C-052888 T.T. Uyeno
Arnica 63.0	29-376.0	61°28'N, 124°37'W - Prairie Creek 3 Section (95F) *Pandorinellina exigua exigua* (Philip) *Polygnathus inversus* Klapper and Johnson age: Early Devonian, Zlichovian-Dalejan boundary to Dalejan, *inversus* to *serotinus* Zones	C-052927 T.T. Uyeno
Arnica (3.0)	31-108.0	61°18'N, 124°42'W - Second Canyon 2 Section (95F) *Polygnathus costatus*? Klapper age: probably early Middle Devonian	C-053031 T.T. Uyeno
Arnica (27.0)	31-84.0	61°18'N, 124°42'W - Second Canyon 2 Section (95F) *Polygnathus kendalli* Johnson and Klapper ozarkodiniform element, possibly that of *Pandorinellina expansa* Uyeno and Mason age: Early Devonian, (*serotinus* Dalejan Zone)	C-053029 T.T. Uyeno
Arnica 403.0	32-1275.0	61°18'N, 124°39'W - Second Canyon I Section (95F) *Alveolites* sp. *Thamnopora* sp. large echinoderm ossicle with single axial canal age: probably early Middle Devonian	C-052840 A.W. Norris
Headless 50.0	13-599.5	61°43'N, 124°50'W - West Tundra I Section (95F) *Eoschuchertella adoceta* (Crickmay) *Spinulicosta* sp. cf. *S. stainbrooki* Crickmay *Atrypa* sp. *Emanuella* sp. pelecypod fragment age: *adoceta* Zone; Eifelian (early Middle Devonian)	C-057791 A.W. Norris
Headless 81.4	39-436.0	61°45'N, 124°25'W - Ram Plateau I Section (95F) bryozoan fragment *Atrypa* sp. "*Carinatina*" sp. *Emanuella* sp. *Warrenella* sp. *Nowakia* sp. *Tentaculites* sp. pelecypod echinoderm ossicles with single axial canals *Polygnathus parawebbi* Chatterton age: Eifelian, early Middle Devonian	C-052967 A.W. Norris & T.T. Uyeno
Headless 82.0	32-1445.0	61°18'N, 124°39'W - Second Canyon I Section (95F) *Thamnopora* sp. *Desquamatia* sp. cf. *D. aperanta* (Crickmay) age: *adoceta* Zone, Eifelian, Middle Devonian	C-052847 A.W. Norris
Headless 12.0	32-1375.0	61°18'N, 124°39'W - Second Canyon I Section (95F) *Emanuella* sp. *Nowakia* sp. *Tentaculites* sp. *Dechenella* (*Dechenella*) sp. age: probably early Middle Devonian	C-052844 A.W. Norris
Headless 39.5	38-390.0	61°40'N, 124°27'W - Sundog Creek I Section (95F) stromatoporoid cup coral fragments strophomenacid fragments *Atrypa* sp. echinoderm ossicle with single axial canal *Polygnathus parawebbi* Chatterton age: Middle Devonian; mid-Eifelian to early Givetian, *australis* to Lower *varcus* Zones	C-052905 A.W. Norris & T.T. Uyeno
Headless 70.0	31-340.0	61°18'N, 124°42'W - Second Canyon 1 Section (95F) *Polygnathus linguiformis linguiformis* Hinde *P. parawebbi* Chatterton *Steptotaxis pedderi* (Uyeno and Mason) age: early Middle Devonian; mid-Eifelian, *australis* Zone	C-053037 T.T. Uyeno
Nahanni 59.4	39-627.0	61°45'N, 124°25'W - Ram Plateau I Section (95F) *Coenites* sp. *Thamnopora* sp. *Favosites* sp. age: Middle Devonian	C-052969 A.W. Norris

PART 2

SELECTED FAUNAL DETERMINATIONS FROM MAPPING
(Collected by D.G. Cook)
(Grouped by formation)

Formation and GSC Locality No.	Locality, Fauna and Age	Paleontologist
Road River C-045662	West of Headless Range at 61°29'30"N, 124°49'05"W *Meristella*? sp. age: Early Devonian	A.W. Norris
Road River C-045678 local scree	61°17'05"N, 124°59'05"W; Second Canyon, 95F/7 echinoderm and brachiopod fragments *Cyrtograptus* aff. *C. radians* Törnquist *Dendrograptus* sp. *Monograptus* sp. age: Early Silurian, late Wenlock	B.S. Norford
Road River (near top) C-045679	61°17'10"N, 124°57'15"W; NTS 95F/7 *"Dolerorthis"* sp. *Leptaena* sp. *Ancillotoechia* sp. echinoderm ossicle with single axial canal large echinoderm ossicle with five petal-shaped axial canal age: *Quadrithyris* Zone of Nevada, early Gedinnian, Early Devonian	A.W. Norris
Road River C-045680	61°17'10"N, 124°57'15"W; NTS 95F/7 *Coenites rectilinearis* Simpson *Leptaena* sp. *Schizophoria*? sp. - fragment *Platyceras* sp. echinoderm ossicle with single axial canal age: Early Devonian	A.W. Norris
Road River C-045689	61°30'40"N, 124°52'25"W; 95F/10 *Monograptus* aff. *M. spiralis* (Geinitz) age: Early Silurian, probably latest Llandovery	B.S. Norford
Road River (near top) C-045700	61°30'05"N, 125°48'55"W; NTS 95F/10 *Leptaena* sp. *Spinatrypa* sp. cf. *Eurekaspirifer* sp. ostracode age: *E. pinyonensis* Zone, early Zlichovian, late Early Devonian	A.W. Norris
Road River C-059462	61°31'30"N, 124°48'22"W (southwest of Cadillac Mine - 95F) *Favosites* sp. *Monograptus* aff. *M. priodon* (Bronn) age: Early Silurian, probably late Llandovery or Wenlock	B.S. Norford
Road River C-059464	61°32'05"N, 124°48'48"W (southwest of Cadillac Mine - 95F) echinoderm debris brachiopods *Favosites* sp. *Monograptus* aff. *M. priodon* (Bronn) age: Early Silurian, probably late Llandovery or Wenlock	B.S Norford
Road River C-059466	61°22'10"N, 124°59'20"W (3 miles southwest of the Gate - 95F) *Monograptus* 2 spp. *M.* ex gr. *M. spiralis* (Geinitz) *Cyrtograptus sakmaricus* Koren age: Early Silurian, latest Llandovery, *C. sakmaricus* - *C. laqueus* Zone	B.S. Norford
Cadillac (megabreccia mbr) C-059453	61°33'32"N, 124°44'50"W (2 miles east of Cadillac Mine - 95F) favositid tabulate coral *Egosiella* sp. undet. *Zelophyllum*? sp. *Neomphyma*? sp. age: Early Devonian, possibly Lochkovian	A.E.H. Pedder
Cadillac (megabreccia mbr) C-059454	61°33'16"N, 124°45'22"W (1 1/2 miles east of Cadillac Mine - 95F) *Egosiella* sp. orthoconic nautiloid age: Early Devonian, possibly Lochkovian	A.E.H. Pedder
Cadillac (megabreccia mbr) C-059456	61°39'10"N, 124°42'00"W (Tundra Ridge - 95F) *Egosiella* sp. age: Early Devonian, possibly Lochkovian	A.E.H. Pedder
Cadillac (megabreccia mbr) C-059457	61°42'11"N, 124°39'13"W (Tundra Ridge - 95F) *Thamnopora* sp. *Egosiella* sp. age: Early Devonian, possibly Lochkovian	A.E.H. Pedder
Cadillac (megabreccia mbr) C-059459	61°39'18", 124°42'30"W (Tundra Ridge - 95F) Sponge spicules *Favosites* sp. undet. *Egosiella* sp. undet. *Thamnopora* sp. *Schizophoria* sp. *Salopina submurifer* Johnson, Boucot and Murphy *Gypidula* sp. indet. *Koechuchertella* sp. indet. *Phragmostrophia* sp. indet. *Ancillotechia* sp. cf. *A. gutta* Johnson, Boucot and Murphy *Atrypa nieczlawiensis* Kozlowski *Howellella* sp. indet. *Megakozlowskiella*? sp. indet *Cyrtina* spp. undet. *Tubomphalus* sp. undet. *Conocardium* sp. indet. age: Early Devonian, Lochkovian	A.E.H. Pedder
Cadillac C-045661	West of Headless Range at 61°28'20"N, 124°48'25"W cf. *Howellella* sp. echinoderm ossicle with single axial canal age: Early Devonian	A.W. Norris
Cadillac C-045664	61°31'15"N, 124°48'05"W (south of Cadillac Mine - 95F) cup coral *Coenites* sp. *Favosites* sp. finely costate pentamerid *Atrypa* sp. *Leptocoelia* sp. *Machaeraria* sp. cf. *Ancillotoechia* sp. echinoderm ossicle age: *Quadrithyris* Zone of Nevada, Lochkovian, Early Devonian	A.W. Norris
Cadillac C-045688	61°31'10"N, 124°53'25"W (in the 95F/10 map sheet) *Spirigerina* sp. cf. *S. supramarginalis* (Khalfin) *Ancillotoechia* sp. cf. *Howellella* sp. very coarsely costate brachiopod fragments *Nowakia* small smooth pelecypod age: *Quadrithyris* Zone of Nevada, Lochkovian, Early Devonian	A.W. Norris
Cadillac C-045697	61°15'25"N, 124°57'15"W (in the 95F/7 map sheet) large coarsely costate pentamerid? *Howellella* sp. cf. *Ancillotoechia* sp. age: Early Devonian	A.W. Norris
Cadillac (near top) C-059479	Manetoe Range at 61°37'50"N, 125°10'05"W cf. *Gypidula pelagica* (Barrande) undet. trilobite free cheek fragment age: Early Devonian	A.W. Norris
Cadillac C-059496	61°51'10"N, 124°57'10"W (Footwall of Tundra Thrust - 95F) cup coral *Leptaena* sp. *Spirigerina*? sp. cf. *S.*? *supramarginalis* (Khalfin) *Atrypa*? sp. *Ancillotoechia*? sp. echinoderm ossicle age: late Lochkovian (early Early Devonian)	A.W. Norris
Cadillac C-045660	61°28'20"N, 124°48'25"W (west of Headless Range - 95F) *Atrypa* sp. cf. *A. nieczlawiensis* Kozlowski cf. *Machaeraria* sp. echinoderm ossicle age: early Lochkovian (Early Devonian)	A.W. Norris
Cadillac C-045663	61°29'25"N, 124°41'50"W (west of Headless Range - 95F) *Gracianella*? sp. *Atrypa* sp. *Quadrithyris* sp. *Ambocoelia* sp. cf. *Howellella* sp. echinoderm ossicle with single axial canal age: *Quadrithyris* Zone of Nevada, Lochkovian, Early Devonian	A.W. Norris
Arnica (basinal mbr) C-045685	61°28'15"N, 124°50'50"W; NTS 95F/7 *Favosites* *Gasterocoma*? *bicaula* Johnson and Lane echinoderm ossicle with single axial canal age: mid-Emsian to early Eifelian	A.W. Norris

Formation and GSC Locality No.	Locality, Fauna and Age	Paleontologist
Arnica (basinal mbr) C-059490	Footwall of Tundra Thrust at 61°51'30"N, 124°55'35"W *Coenites*? sp. large echinoderm ossicle with single axial canal large echinoderm ossicle with five-pointed star-shaped axial canal cf. *Gasterocoma*? *bicoula* Johnson and Lane undet. coarsely costate brachiopod - impression ages: probably late Early Devonian The echinoderm ossicle with a dumb-bell shaped axial canal, questionably present, is assigned to *Gasterocoma*? *bicoula* Johnson and Lane. The "two-holer" is widely distributed in northern Canada and elsewhere in beds ranging in age from about mid-Emsian of the Early Devonian to early Eifelian of the early Middle Devonian. However, the form appears to occur most abundantly in beds of late Emsian age where firmly dated by associated conodonts.	A.W. Norris
Funeral C-059452	61°33'44"N, 124°43'39"W (3 miles east of Cadillac Mine - 95F) *Stylioling fissurella* (Hall) ages: late Early Devonian to early Middle Devonian	A.W. Norris
Headless C-045656	61°26'55"N, 124°45'00"W (Headless Range - 95F) *Spinulicosta* sp. *S. stainbrooki* Crickmay *Desquamatia* sp. cf. *D. aperanta* (Crickmay) ages: Eifelian, early Middle Devonian	A.W. Norris
Headless C-045657	61°26'55"N, 124°45'00"W (Headless Range - 95F) *Desquamatia aperanta* (Crickmay) coarsely costate pelecypod fragment *Tentaculites* sp. ages: Eifelian, early Middle Devonian	A.W. Norris
Headless C-059482	61°36'10"N, 124°08'10"W (North Manetoe Range - 93F) *Warrenella praekirki* Johnson ages: early Eifelian (early Middle Devonian)	A.W. Norris
Nahanni Fm. C-059486	Prairie Creek at 61°49'40"N, 124°49'20"W *Desquamatia* sp. cf. *D. aperanta* (Crickmay) ambocoeliid brachiopod - impression of a very young form ages: edocetz Zone, Eifelian, early Middle Devonian	A.W. Norris

APPENDIX 3

MEASURED SECTIONS AND WELL SECTIONS

(Sections 17, 20 and 21 are not included)

Samples from units within sections that yielded faunas that were identified are indicated by their GSC locality number (e.g., C-056789). Faunal information concerning these paleontological samples may be found in Appendix II under the appropriate GSC locality number.

CATHEDRAL MOUNTAIN SECTION

SECTION 1. This is a north-dipping section that originates at Lat. 61°42'N, Long. 125°38'W (or 6843250N, 360100E in UTM coordinates). It extends northward across Cathedral Mountain on Clearwater Creek in the northwest quadrant of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is best seen in RCAF air photo A17441-077.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Arnica Formation				
21	Dolostone[1]: moderately resistant; finely to medium crystalline; dark grey to brownish grey, weathering dark grey; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; a dolomitized crinoid wackestone with abundant two-holed crinoids; some scattered vugs of leached biogenic material; basal contact abrupt.	13.5	(44.3)	1644.0	(5393.7)
	Incomplete thickness of Arnica Formation is 13.5 m (44.3 ft).				
	Sombre Formation				
20	Dolostone: moderately resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; thin beds of laminite (some fenestral fabric) are interbedded with thick, slightly vuggy and biostromal beds; basal contact gradational, continuous.	60.0	(196.9)	1630.5	(5349.4)
19	Dolostone: resistant; finely to medium crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum very thin bedded, maximum very thick bedded; thick, biostromal beds grade upwards to slightly silty and yellow laminite that contains fenestral fabric; in places irregular to lenticular vugs oriented parallel to bedding are filled with quartz crystals oriented perpendicular to bedding; a small amount of solution-collapse breccia in some thick beds; basal contact gradational, continuous.	33.0	(108.3)	1570.5	
18	Dolostone: resistant; finely to medium crystalline; light grey, weathering light grey (almost white); bedding planar but indistinct, mode very thick bedded, minimum medium bedded, maximum nonbedded; some solution-collapse breccia but most of this sucrosic dolomite is featureless; basal contact gradational, continuous.	162.0	(531.5)	1537.5	
17	Dolostone: resistant; finely to medium crystalline; medium brownish grey, weathering light brownish grey; bedding planar but indistinct, mode thick bedded, minimum thin bedded, maximum very thick bedded; largely featureless, sucrosic dolomite; a few corals visible but entire unit is probably biostromal; basal contact gradational, continuous.	48.0	(157.5)	1375.5	
16	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum very thin bedded, maximum very thick bedded; thick, featureless, but probably biostromal beds (some corals) grade upwards to thin, yellowish-grey, silty laminite intervals; some fenestral fabric and mud chip breccias in laminites; only 4 intervals of laminite in this unit; basal contact gradational, continuous.	52.5	(172.2)	1327.5	
15	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum very thin bedded, maximum very thick bedded; thick, featureless, slightly vuggy beds of sucrosic dolomite grade upwards to laminites and thin beds in more than 6 cycles; basal contact gradational, continuous.	60.0	(196.9)	1275.0	
14	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum very thin bedded, maximum very thick bedded; almost all featureless, thick bedded dolomite interrupted by 2 thin, silty yellow laminite intervals; a little solution-collapse breccia in the thick dolomite; basal contact gradational, continuous.	90.0	(295.3)	1215.0	
13	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; thick, medium grey, slightly vuggy beds grade upwards to light grey laminites with fenestral fabric; some thick beds have local swellings that may be small bioherms with about 2.0 m of apparent relief; basal contact gradational, continuous.	90.0	(295.3)	1125.0	
12	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum very thin bedded, maximum very thick bedded; light grey, featureless dolomite is interrupted by several, thin, recessive intervals of silty yellow laminite (a little faint crossbedding in laminites); basal contact gradational, continuous.	81.0	(265.7)	1035.0	
11	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; similar to overlying unit but recessive yellow beds are more common; some yellow intervals lie with a sharp scoured contact on underlying grey beds; basal contact gradational, continuous.	60.0	(196.9)	954.0	
10	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum very thin bedded, maximum very thick bedded; similar to overlying unit with several intervals about 0.5 m thick of yellow silty laminite; basal contact gradational, continuous.	70.5	(231.3)	894.0	
9	Dolostone: resistant; finely crystalline; light to medium grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; medium grey thick beds grade upwards to light grey laminite in 3.0 to 10.0 m thick cycles; yellow beds absent; basal contact gradational, continuous.	90.0	(295.3)	823.5	
8	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thin bedded, maximum thick bedded; thick, grey, vuggy beds grade upwards to yellowish grey, recessive, silty, thin beds in distinct cycles 3.0 to 10.0 m thick; some fenestral fabric and pink stain in thin beds; basal contact gradational, continuous.	78.0	(255.9)	733.5	
7	Dolostone: resistant; finely crystalline; medium grey, weathering light grey; bedding planar and indistinct, uniformly very thick bedded; abundant vugs of leached, biogenic material; basal contact gradational, continuous.	111.0	(364.2)	655.5	
	Total thickness of the Sombre Formation is 1086.0 m (3563.0 ft).				
	Vera Formation				
6	Limestone (80 per cent exposed): moderately recessive wackestone; medium greenish grey, weathering medium greyish green; bedding wavy and discontinuous, mode thin bedded, minimum very thin bedded, maximum medium bedded; moderately fossiliferous with large crinoids, brachiopod and bryozoan fragments; basal contact gradational, continuous; GSC loc. C-057800 (see Appendix 2).	99.0	(324.8)	544.5	(1786.0)

[1]Exposure is 100 per cent unless otherwise specified.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
5	Limestone: recessive; argillaceous calcilutite; medium yellowish grey, weathering light- to medium-yellowish grey; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; mainly thin bedded, relatively unfossiliferous couplets of yellow, argillaceous calcilutite and grey calcilutite; one well-developed, resistant biostromal interval of coral wackestone or boundstone at 42.0 m with individual biohermal swellings up to 2.0 m thick; basal contact gradational, continuous.	48.0	(157.5)	445.5	
	Total thickness of the Vera Formation is 147.0 m (482.3 ft).				
	Road River Formation				
4	Limestone (50 per cent exposed): moderately resistant; argillaceous calcilutite; medium yellowish grey to brown, weathering light yellowish grey to brown; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded, couplets of yellow, argillaceous calcilutite alternating with grey calcilutite form individual beds; the non-argillaceous, grey parts of beds are thicker than in underlying units; some brachiopods on bed surfaces; basal contact gradational, continuous.	112.5	(369.1)	397.5	(1304.1)
3	Limestone (50 per cent exposed): moderately recessive; argillaceous calcilutite; medium yellowish grey to dark brown, weathering medium yellowish grey to brownish yellow; bedding planar to wavy, mode laminated, minimum thinly laminated, maximum very thin bedded; individual beds are couplets as in overlying unit with some very argillaceous, almost yellow weathering intervals in the unit; scattered small brachiopods on bed surfaces; basal contact gradational, continuous; GSC loc. C-057797 (see Appendix 2).	120.0	(393.7)	285.0	
2	Limestone: recessive; argillaceous calcilutite; dark yellowish brown to brown, weathering medium- to light-yellow and yellowish brown; bedding planar, mode laminated, minimum thinly laminated, maximum very thin bedded; same as overlying unit but more argillaceous with some sooty black, noncalcareous, organic matter; some distinctly erosional contacts between beds with medium brown calcilutite beds resting with scoured contacts on yellow, argillaceous beds; basal contact gradational, continuous.	90.0	(295.3)	165.0	
1	Limestone: moderately recessive; argillaceous calcilutite, dark to medium yellowish brown, weathering medium yellowish brown to yellow; bedding planar and smooth, mode laminated, minimum thinly laminated, maximum very thin bedded; uniformly platy with argillaceous partings; homogeneous lithology within bed unlike overlying units; basal contact at stream level.	75.0	(246.1)	75.0	
	Incomplete thickness of the Road River Formation is 397.5 m (1304.1 ft).				
	Total thickness of the Catherdal Mountain Section is 1644.0 m (5393.7 ft).				
	In a section supplied by Banff Oil Ltd. that is continuous with this section, the combined thickness of the Funeral and Headless formations is 366.0 m and the Nahanni Formation is 12.0 m thick. It is estimated that of the combined thickness of the Funeral-Headless formations, 244.0 m is of the Funeral Formation and 122.0 m is of the Headless Formation.				

ARNICA RIDGE I SECTION

SECTION 2. This is a shallow, west-dipping section that begins at Lat. 61°43'N, Long. 125°17'W (or 6844750N, 379200E in UTM coordinates). The section extends westward across the Arnica Range in the northern part of the Virginia Falls map area (95F). The section is best seen in RCAF air photo A17441-081. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Arnica Formation				
23	Dolostone: recessive; medium to very coarsely crystalline; light grey to cream, weathering light grey; bedding planar but poorly developed, mode very thick bedded, maximum nonbedded; some very coarsely fragmental but indistinct breccia with angular clasts but mostly white, featureless dolomite; basal contact abrupt. This unit is part of the Manetoe facies dolomite.	31.5	(103.3)	1052.0	(3451.4)
22	Dolostone (50 per cent exposed): moderately resistant, finely to medium crystalline; dark brown, weathering medium to dark brown; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; a petroliferous fetid dolomite; abundantly crinoidal, with some two-holed crinoids and some stromatoporoids; faintly laminated in part; some solution-collapse mosaic breccia; basal contact gradational, continuous.	80.0	(262.5)	1020.5	
	Incomplete thickness of the Arnica Formation is 111.5 m (365.8 ft).				
	Sombre Formation				
21	Dolostone (80 per cent exposed): resistant; finely crystalline; medium grey, weathering medium- to light-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; faintly laminated and unfossiliferous; basal contact gradational, continuous.	93.0	(305.1)	940.5	(3084.0)
20	Dolostone (90 per cent exposed): resistant; finely to very finely crystalline; light to medium grey, weathering light grey to buff, bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; some dark and light grey, interlaminated dolomite, but mainly light grey; basal contact gradational, continuous.	60.0	(196.9)	847.5	
19	Dolostone (60 per cent exposed): resistant; fine to medium crystalline; light grey to buff, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; abundant, small, moldic vugs strung out parallel to bedding; basal contact gradational, continuous.	60.0	(196.9)	787.5	
18	Dolostone (20 per cent exposed): resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; mainly faintly laminated with a few, dark grey, crinoidal beds.	54.0	(177.2)	727.5	
17	Dolostone (30 per cent exposed): brownish grey to dark brown petroliferous, as in underlying dolostone; moderately resistant, finely to medium crystalline; dark brownish grey to dark brown, weathering medium- to dark-brownish grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum massive or nonbedded; petroliferous and fetid with abundant crinoids and some corals, most of unit is a mosaic breccia with white, coarsely crystalline dolomite cementing blocky clasts. This unit may be a tongue of the Arnica Formation.	15.0	(49.2)	673.5	
16	Dolostone (80 per cent exposed): resistant; finely crystalline; light grey to yellow, weathering light grey to yellowish grey; mode medium bedded, minimum medium bedded, maximum thick bedded; featureless or faintly colour-				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	laminated beds of dolomite alternate with thin yellow beds containing fenestral fabric; a few, vuggy, grey beds occur near the top of the unit; basal contact gradational, continuous.	78.0	(255.9)	658.5	
15	Dolostone (80 per cent exposed): resistant; finely crystalline; medium to light grey, weathering very light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; mostly featureless to slightly colour-laminated; a few thick and vuggy coralline beds near the top of the unit; basal contact gradational, continuous.	94.5	(310.1)	580.5	
14	Dolostone (80 per cent exposed): resistant; finely crystalline; medium to light grey, weathering light grey, bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; mostly featureless with a little yellow mottling; basal contact gradational, continuous.	45.0	(147.6)	486.0	
13	Dolostone (80 per cent exposed): resistant, very finely crystalline; light grey, weathering light grey; bedding lenticular, mode thick bedded, minimum medium bedded, maximum very thick bedded; some yellow mottling but otherwise featureless; basal contact gradational, continuous.	33.0	(108.3)	441.0	
12	Dolostone (80 per cent exposed): resistant; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; scattered vugs of leached biogenic material; basal contact gradational, continuous.	48.0	(157.5)	408.0	
11	Dolostone (60 per cent exposed): resistant; finely to medium crystalline; medium- to dark-grey, weathering medium grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; moderately abundant thamnoporid-like and horn corals in fetid dolostone (this unit and units 9 and 10 form the middle dark band of the Sombre Formation); basal contact gradational, continuous.	48.0	(157.5)	360.0	
10	Dolostone (90 per cent exposed): medium grey; thick bedded, as in underlying unit; basal contact gradational, continuous.	6.0	(19.7)	312.0	
9	Dolostone: resistant; finely to medium crystalline; medium grey, weathering light- to medium- grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; abundant vugs of leached biogenic material with a few horn corals; basal contact gradational, continuous.	24.0	(8.7)	306.0	
8	Dolostone (90 per cent exposed): 6 to 8 cycles of grey dolostone grading up to yellowish-grey laminate as in the underlying unit; basal contact gradational, continuous.	27.5	(90.2)	282.0	
7	Dolostone (90 per cent exposed): resistant; finely to very finely crystalline; light grey, weathering light grey to yellowish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; 6 cycles of medium grey, vuggy beds grading upwards to silty, yellowish-grey dolostone laminates containing fenestral fabric; sharp erosional contacts at bases of some trough crossbedded dolosiltites; basal contact gradational, continuous.	32.0	(104.9)	254.5	
6	Dolostone (80 per cent exposed): resistant; finely crystalline; light grey, weathering light grey to light yellowish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; 4 cycles of featureless, medium grey beds grading upwards to yellowish grey dolomite laminite containing fenestral fabric; yellow weathering beds are silty (qtz.); basal contact gradational, continuous.	15.0	(49.2)	222.5	
5	Dolostone (80 per cent exposed): resistant; finely crystalline; light-to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; some recognizable intervals of carbonate mud-supported type breccia occur in this unit of otherwise featureless dolomite; basal contact gradational, continuous.	55.5	(182.1)	207.5	
4	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering light grey to yellowish grey; mode thick bedded, minimum medium bedded, maximum very thick bedded; mostly featureless dolomite with some crinoids; 2 thin yellow beds of silty dolomite laminite containing fenestral fabric; basal contact gradational, continuous.	33.0	(108.3)	152.0	
3	Dolostone: resistant; finely crystalline; light grey, weathering very light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; some faint colour laminations; some beds with fairly abundant vugs of leached biogenic material; basal contact gradational, continuous.	48.5	(159.1)	119.0	
	Total thickness of the Sombre Formation is 870.0 m (2854.3 ft).				
	Camsell Formation (*Corridor Member*)				
2	Dolostone A: resistant; finely to medium crystalline; colour dark- to light-grey, weathering dark- to light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded, dark grey beds grade upward to light grey laminites in 6 distinct cycles that are capped by the yellow dolomite of dolostone B.				
	Dolostone B: recessive; finely to very finely crystalline; impurities, silt; yellow, weathering light- to medium-yellow and yellowish grey; mode very thin bedded, minimum laminated, maximum very thin bedded; a dolomite laminite with fenestral fabric.				
	Basal contact gradational, continuous.	52.5	(1972.2)	70.5	(231.3)
1	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely to medium crystalline; dark- to light-grey, weathering dark to light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; dark grey beds grade upwards to light grey laminite in 4 distinct cycles. Yellow dolomite of dolomite B caps some cycles, some stromatactis infilled with white dolomite in the dark grey beds.				
	Dolostone B: recessive; finely crystalline; impurities, silt; reddish-orange to yellow, weathering orange and yellow; bedding lenticular, mode very thin bedded, minimum laminated, maximum thin bedded; a hematitic and sandy dolomite, weakly crossbedded, thicker beds are planar and display compaction dewatering structures.				
	Basal contact gradational, continuous.	18.0	(59.1)	18.0	
	Incomplete thickness of the Corridor Member of the Camsell Formation is 70.5 m (231.3 ft).				
	Total thickness of the Arnica Ridge 1 Section is 1052.0 m (3451.4 ft).				

ARNICA RIDGE 2 SECTION

SECTION 3. This is a west-dipping section that begins at Lat. 61°42'N, Long. 125°16'W (or 6842300N, 380200E in UTM coordinates). It extends westward across the Arnica Range in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is best shown in RCAF air photo A17441-081.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Funeral Formation				
40	Limestone: recessive and argillaceous; calcilutite; brown yellow weathering light yellowish brown to yellow; bedding planar and smooth, mode very thin bedded, minimum laminated, maximum thin bedded, shaly partings.	20.0	(65.6)	1839.0	(6033.4)
	Incomplete thickness of the Funeral Formation is 20.0 m (65.6 ft).				
	Landry Formation? (or Grizzly Bear of Gabrielse et al., 1973)				
39	Limestone: slightly resistant; medium brown, weathering light grey; bedding planar and smooth, mode thin bedded, minimum thin bedded, maximum medium bedded; pelletal wackestone and packstone.	40.0	(131.2)	1819.0	(5968.0)
	Total thickness of the Landry Formation is 40.0 m (131.2 ft).				
	Sombre Formation				
38	Dolostone: poorly exposed, medium to dark brownish-grey dolomite scree as in underlying unit; basal contact not noted.	89.5	(293.7)	1779.0	(5836.6)
37	Dolostone: very resistant; cliff-forming unit of finely crystalline dolomite; medium- to dark-brownish grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; abundant stromatactis with sediment-floored cavities in 5 to 10 m thick intervals that are cemented with white dolomite; small patches of angular solution-collapse breccia; basal contact gradational, continuous.	30.0	(98.4)	1689.5	
36	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering medium- to light-grey; bedding planar to wavy, mode thick bedded, minimum medium bedded, maximum thick bedded; thin bedded light grey laminite occurs in intervals less than 1.0 m thick and commonly separates thicker beds that pinch and swell; each planar bed is capped by a thin, discontinuous laminated parting; basal contact gradational, continuous.	36.0	(118.1)	1659.5	
35	Dolostone: moderately resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum medium bedded, maximum thick bedded; thick, featureless beds interbedded with light grey laminites; some laminated intervals are light yellowish grey; basal contact gradational, continuous.	51.0	(167.3)	1623.5	
34	Dolostone (40 per cent exposed): similar to underlying unit; basal contact not noted.	31.5	(103.3)	1572.5	
33	Dolostone: resistant; finely crystalline; light grey to yellowish grey, weathering light grey to greyish yellow; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; thick grey beds grade upwards to light grey laminite and to recessive yellow, silty laminated or crossbedded (troughs less than 0.2 m across) intervals; yellow silty intervals rest with a sharp scoured contact on underlying grey dolomite; basal contact gradational, continuous.	99.0	(324.8)	1541.0	
32	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; many beds with moldic porosity from leached, biogenic material; vugs (up to 10 cm long) strung out parallel to bedding; light grey laminite intervals separate some beds; basal contact gradational, continuous.	75.0	(246.1)	1442.0	
31	Dolostone (80 per cent exposed): moderately resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; slightly recessive; very smooth weathering, very light grey; faintly laminated dolostone predominates in the lower part of unit whereas vuggy, possibly biostromal, thick beds are abundant in the more resistant upper part of the unit; basal contact gradational, continuous.	102.0	(334.6)	1367.0	
30	Dolostone: resistant; cliff-formed, finely crystalline; dark brownish grey, weathering dark- to medium-brownish grey; bedding planar, mode nonbedded, minimum very thick bedded, maximum nonbedded; abundant large vugs of leached corals, partly cemented with white dolomite, scattered crinoids with some two-hole crinoids and rugose coral ghosts; several stratiform zones of solution collapse breccia; 1.0 to 2.0 m thick; a biostromal unit; basal contact not noted.	15.0	(49.2)	1265.0	
29	Dolostone: resistant; finely crystalline; dark brownish grey, weathering dark brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; abundantly crinoidal but little other fauna, not vuggy; basal contact gradational, continuous.	22.5	(73.8)	1250.0	
28	Dolostone (80 per cent exposed): mostly resistant and cliff-forming, finely crystalline; dark brownish grey, weathering dark- to medium-brownish grey; bedding planar, mode nonbedded, minimum very thick bedded, maximum nonbedded; abundant large vugs from leached corals; vugs cemented with white, coarsely crystalline dolomite; several 1.0 to 2.0 m thick zones of solution-collapse breccia in particularly vuggy beds; clasts in breccias show a crude alignment parallel to bedding; many rugose corals and crinoids with some two-holed crinoids; a biostromal unit; basal contact gradational, continuous.	45.0	(147.6)	1227.5	
27	Dolostone: slightly recessive; finely crystalline light grey, weathering light grey; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; slightly vuggy thick beds grade upwards to laminated and rippled laminated beds, up to 40 per cent laminite in the unit; scattered crinoids occur in thick beds, some small scours in laminite intervals floored with crinoidal lag deposits; basal contact gradational, continuous.	24.0	(78.7)	1182.5	
26	Dolostone: slightly resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; slightly vuggy, thick, biostromal beds grade upwards to laminite with fenestral fabric and penecontemporaneous, mud chip breccias; laminites have a slight yellow tint and form about 40 per cent of the unit; a little solution-collapse breccia in some biostromal beds; basal contact gradational, continuous.	64.5	(211.6)	1158.4	
25	Dolostone: recessive; medium crystalline; white, weathering white- to light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; slightly vuggy but otherwise featureless; basal contact gradational, continuous.	31.5	(103.3)	1094.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
24	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; some slightly vuggy beds but mainly featureless; basal contact gradational, continuous.	42.0	(137.8)	1062.5	
23	Dolostone (80 per cent exposed): recessive; finely crystalline; light grey, weathering light grey to greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; medium featureless beds interbedded with laminated stromatolitic beds (LLH-5 stromatolites) with some mud chip, lag breccias; some laminite beds have a faint pink tint; basal contact gradational, continuous.	45.0	(147.6)	1020.5	
22	Dolostone: resistant; coarsely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; very vuggy with large biogenic vugs biostromal beds; some beds contain abundant leached amphiporids ("spaghetti stone"); basal contact gradational, continuous.	108.0	(354.3)	975.5	
21	Dolostone (90 per cent exposed): similar to underlying unit but yellow weathering dolomite is less pronounced; basal contact gradational, continuous.	45.0	(147.6)	867.5	
20	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; beds grade upwards from featureless dolostone to thin-bedded laminite.				
	Dolostone B: recessive; finely crystalline; colour light greyish yellow, weathering light yellow; bedding wavy to lenticular mode very thin bedded, minimum laminated, maximum very thin bedded; silty, commonly with a scoured base and/or top; some stromatolitic laminated intervals.				
	Basal contact gradational, continuous.	69.0	(226.4)	822.5	
19	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum very thick bedded; thick slightly vuggy beds grade upwards to laminite; some small pockets of solution-collapse breccia displaying geopetal fabrics; basal contact abrupt.	30.5	(113.2)	753.5	
	Total thickness of the Sombre Formation is 1069.5 m (3508.9 ft).				
	Camsell Formation (*Corridor Member*)				
18	Dolostone (90 per cent exposed): similar to underlying unit with 7 grey-yellow cycles; dark dolostone burrowed; algal laminations in light dolostone; basal contact not noted.	24.0	(78.7)	719.0	(2358.9)
17	Dolostone A and dolostone B (80 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; dark- to light-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; dark grey, slightly vuggy (biogenic), petroliferous and bioturbated beds grade upwards to light grey laminite in 4 or 5 cycles in this unit.				
	Dolostone B: recessive; finely crystalline; light yellowish grey, weathering light greyish yellow; bedding wavy, mode laminated, minimum laminated, maximum very thin bedded; thin intervals of silty, yellow laminite cap cycles of dolostone A.				
	Basal contact gradational, continuous.	27.0	(88.6)	695.0	
16	Dolostone (90 per cent exposed): 3.0 to 7.0 m thick cycles of dark grey, bioturbated dolostone grading upwards to light grey laminite and silty yellow laminite, as in the underlying unit; a little solution-collapse breccia in some thick beds; basal contact gradational, continuous.	69.0	(226.4)	668.0	
15	Dolostone (90 per cent exposed): same as underlying unit, good fenestral fabric in the yellow, silty dolostone; only fine, 1.0 m thick beds of dark brownish grey dolomite; basal contact gradational, continuous.	150.0	(492.1)	599.0	
14	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; dark grey, commonly bioturbated beds grade upwards to light grey laminite in distinct cycles.				
	Dolostone B: recessive; finely crystalline; light yellowish grey, weathering light yellow; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; platy and silty with some argillaceous, lenticular partings; caps dark- to light-grey cycles of dolostone A.				
	Basal contact gradational, continuous.	7.5	(24.6)	449.0	
13	Dolostone (90 per cent exposed): slightly resistant; finely crystalline; light yellowish grey to light grey, weathering light yellowish grey to yellow; bedding planar, mode medium bedded, minimum very thin bedded, maximum medium bedded; laminite with scattered reworked mud chips; a rather homogeneous unit within the Corridor Member; basal contact gradational, continuous.	34.5	(113.2)	441.5	
12	Similar to the underlying unit but only two dark brownish grey beds; basal contact gradational, continuous.	39.0	(128.0)	407.0	
11	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; dark brownish grey to light grey, weathering dark brownish grey to light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; dark vuggy and slightly bioturbated beds grade upwards to light grey laminite in several distinct cycles.				
	Dolostone B: recessive; finely crystalline; light yellowish grey, weathering light yellow; bedding planar, uniformly laminated; platy with some lenticular partings; thin intervals of dolostone B cap cycles of dolostone A.				
	Basal contact gradational, continuous.	15.0	(49.2)	368.0	
10	Dolostone: resistant; finely crystalline; very light yellow, weathering light yellow; bedding planar and smooth, mode thin bedded, minimum thin bedded, maximum medium bedded; thin, discontinous, rusty coloured, silty seams are common, otherwise featureless; basal contact gradational, continuous.	85.5	(280.5)	353.0	
	This unit is similar to, and may correlate with the Delorme Formation in sections 12 and 21.				
	Total thickness of the Camsell Formation (Corridor Member) is 451.5 m (1481.3 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Vera Formation				
9	Limestone: slightly recessive; calcilutite; medium grey, weathering light grey; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum thin bedded; basal contact gradational, continuous.	24.0	(78.7)	267.5	877.6
8	Limestone: slightly recessive; argillaceous wackestone; dark brownish grey, weathering dark brown to medium yellowish brown; bedding wavy and uneven, mode thin bedded, minimum very thin bedded, maximum thin bedded; scattered brachiopod fragments; some pink and yellow argillaceous and silty partings; basal contact gradational, continuous.	49.5	(162.4)	243.5	
7	Limestone: slightly recessive; argillaceous calcilutite; medium brownish yellow, weathering medium brownish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; abundant, thin, yellow, silty partings; some fenestral fabric and some platy intervals; basal contact gradational, continuous.	25.5	(83.7)	194.0	
6	Limestone: slightly resistant; calcilutite; dark- to medium-grey, weathering medium- to light-grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; scattered corals and crinoid fragments; biogenic material silicified, biostromal in parts with large fasciculate corals that are in place; basal contact abrupt.	37.5	(123.0)	168.5	
5	Limestone: slightly resistant; wackestone; medium greyish pink, weathering medium greyish pink to pink; bedding wavy, uniformly thin bedded; abundant, fragmented brachiopods, crinoids and corals; platy, silty and argillaceous; basal contact gradational, continuous.	25.5	(83.7)	131.0	
4	Limestone: slightly resistant; argillaceous calcilutite; medium yellowish grey, weathering medium yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; entire unit is striped yellow and grey with the argillaceous parts of very thin beds weathering yellow; some brachiopods on bed surfaces; basal contact gradational, continuous. GSC loc. C-057664 (see Appendix 2).	25.5	(83.7)	105.5	
3	Limestone: slightly resistant; argillaceous calcilutite; medium yellowish to pinkish grey; weathering yellowish and pinkish grey; bedding wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; thin beds are couplets with yellow or pink argillaceous calcilutite in very thin beds or laminae between grey calcilutite imparting a finely striped appearance to the unit; large brachiopods in grey calcilutite, whereas argillaceous parts contain abundant crinoid fragments; argillaceous laminae rolled-up and load casted (intrastratal slip); basal contact gradational, continuous.	41.0	(134.5)	80.0	
2	Limestone: slightly recessive; argillaceous calcilutite; medium to dark yellowish grey and pinkish grey; weathering medium yellowish and pinkish grey; uniformly thin bedded; alternating argillaceous and nonargillaceous beds impart a finely striped appearance to the unit; a few amphiporids and thamnoporid-type corals; basal contact gradational, continuous. GSC loc. C-57661 (see Appendix 2).	24.0	(78.7)	39.0	
1	Limestone: slightly recessive; argillaceous calcilutite; similar to overlying unit, pink and yellow weathering with some very thin beds; basal contact not noted - base of section at the Arnica Thrust fault.	15.0	(49.2)	15.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Incomplete thickness of the Vera Formation is 267.5 m (877.6 ft).				
	Total thickness of the Arnica Ridge 2 Section is 1934.0 m (6345.1 ft).				

ARNICA RANGE 3 SECTION

SECTION 6. This is a west-dipping section that extends westward across the north end of the Arnica Range in the Virginia Falls map area (95F) in the District of Mackenzie N.W.T. It begins at Lat. 61°56'N and 125°12'W. This section was supplied by Banff Oil Ltd. (Section JN-2-69).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
7	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; abundant corals (*Coenites*, *Favosites*, *Necostingophyllum* and other rugose corals), brachiopods; thick bedded intervals alternate with thin and medium bedded intervals; basal contact gradational, continuous.	215.0	(705.4)	970.0	(3182.4)
	Incomplete thickness of the Nahanni Formation is 215.0 m (705.4 ft).				
	Headless Formation				
6	Limestone and shale (90 per cent limestone and 10 per cent shale).				
	Limestone: slightly recessive; argillaceous calcilutite; medium grey, weathering light brownish grey; bedding planar and smooth with platy parting, mode thin bedded, minimum thin bedded, maximum medium bedded; rare brachiopods and crinoids but unlike the greenish grey, fossiliferous and nodularly bedded Headless of other areas; basal contact gradational, continuous.	76.0	(49.3)	755.0	(2477.0)
	Incomplete thickness of the Headless Formation is 76.0 m (49.3 ft).				
	Funeral Formation				
5	Shale: recessive and calcareous; medium brownish grey, weathering light brown; bedding planar and fissile to thin bedded, some thin bedded intervals of calcareous mudstone; occasional arthoreids and goniatites; thin bedded intervals grade upwards to platy shales; basal contact gradational, continuous.	331.0	(1086.0)	679.0	(2227.7)
4	Shale: recessive and calcareous; medium brownish grey, weathering light brown to light grey; bedding planar and smooth; rare interbeds of shaly limestone near the top of the unit, these limestone ribs contain crinoids and brachiopods; basal contact gradational, continuous.	151.0	(496.4)	348.0	
3	Limestone: slightly recessive; argillaceous calcilutite; dark grey, weathering medium brownish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; a few intervals of calcareous shale, platy; this unit forms a resistant band in the middle of the Funeral; basal contact gradational, continuous.	122.0	(400.3)	197.0	
2	Limestone: slightly recessive and argillaceous; dark grey, weathering medium to dark grey; bedding planar and smooth, mode thin bedded, minimum thin bedded, maximum thick bedded; abundant ironstone concretions and nodular chert irregularly dispersed throughout; some intervals of platy shale; occasional lenses of crinoids; some thick beds contain abundant tabulate corals (*Favosite*, *Coenites*), bryozoan, brachiopods and trilobites; this unit forms a slightly resistant base to the Funeral Formation; basal contact abrupt.	64.0	(210.0)	75.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Total thickness of the Funeral Formation is 668.0 m (2191.6 ft).				
	Arnica Formation				
1	Dolostone: resistant, finely crystalline, dark grey, weathering dark- to medium-grey; thick planar bedding; some crinoidal beds including some two-holed crinoids; some solution-collapsed breccia cemented by white dolomite.	11.0	(36.1)	11.0	(36.1)
	Incomplete thickness of the Arnica Formation is 11.0 m (36.1 ft).				
	Total thickness of the Arnica Range 3 Section is 970.0 m (3182.4 ft).				

SOUTH MANETOE 2 SECTION

SECTION 5. This is a west-dipping section that begins at 61°34'N, 125°12'W (or 6827350N, 383000E in UTM coordinates). It extends westward across the southern end of the Manetoe Range just north of the South Nahanni River in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. This section is best seen in RCAF air photo A17628-093.

	Funeral Formation				
17	Limestone (40 per cent exposed): moderately recessive; argillaceous calcilutite; medium yellowish grey, weathering light yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; a platy (fissile) argillaceous lime mudstone with some shale; basal contact gradational, continuous.	90.0	(295.3)	1179.0	(3868.1)
	Incomplete thickness of the Funeral Formation is 90.0 m (295.3 ft).				
	Sombre Formation (*detrital member*)				
16	Limestone (40 per cent exposed): moderately recessive; fossiliferous wackestone; dark grey, weathering dark grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; crinoidal coralline, and argillaceous; a poorly exposed vegetated dip slope; basal contact gradational, continuous.	90.0	(295.3)	1089.0	(3572.8)
15	Limestone (70 per cent exposed): moderately resistant; fossiliferous wackestone; dark grey, weathering dark grey; bedding planar to wavy, mode medium bedded, minimum medium bedded, maximum thick bedded; crinoidal and intraclast-bearing wackestones; thick debris flows with rounded tabular and equant lime mud clasts up to 20 cm long; long dimensions of grains tend to be parallel to bedding; some black chert nodules; basal contact gradational, continuous.	179.0	(587.3)	999.0	
	Total thickness of the Sombre Formation (detrital member) is 269.0 m (882.5 ft).				
	Cadillac Formation				
14	Siltstone (30 per cent exposed): recessive; argillaceous and dolomitic; minimum class clay, modal class silt; medium brownish grey, weathering light- to medium-brownish grey to brown; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy, finely laminated beds with silt laminae weathering in relief; some silty dolomite; basal contact gradational, continuous.	38.5	(126.3)	820.0	(2690.1)
13	Limestone (75 per cent exposed): resistant; wackestone and packstone; medium grey, weathering light- to medium-grey, bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; graded beds of intraclast (light grey lime mudstone chips <2 cm long) and crinoid-bearing wackestone and packstone; parts of small channels at the base of some debris flows truncate parts of underlying flows (full dimensions not exposed); some of this unit is vegetated; it is possible that the covered parts may be recessive siltstone; basal contact gradational, continuous.	44.5	(146.0)	781.5	
12	Dolostone and limestone (20 per cent exposed, 60 per cent dolostone, 40 per cent limestone). Dolostone: recessive; finely crystalline; medium brown to pink, weathering light- to medium-brown and pink; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; platy, argillaceous and silty dolostone - almost a siltstone, much of this unit is beneath a vegetated slope. Limestone: moderately resistant; fossiliferous wackestone; medium- to dark-grey, weathering light- to medium-grey; bedding planar to wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; crinoidal and intraclast-bearing wackestone and packstone; intraclasts are light and medium grey lime mudstone chips (<2 cm long); some normal grading of debris flows; fine grained, skeletal debris tends to be silicified, occurs as intervals less than 1 m thick to several metres thick interbedded with platy, pink dolostone; basal contact gradational, continuous.	36.0	(118.1)	737.0	
11	Limestone (20 per cent exposed): recessive; argillaceous calcilutite; dark grey, weathering dark to medium grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy and silty; a vegetated dip slope so recessive character is exaggerated; basal contact gradational, continuous.	33.0	(108.3)	701.0	
10	Dolostone and limestone (20 per cent exposed, 60 per cent dolostone 40 per cent limestone). Dolostone: moderately recessive; silty and finely crystalline; brownish pink, weathering medium-to light-brown and pink; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; platy and laminated; laminations formed of silt. Limestone: recessive; slightly argillaceous calcilutite; dark grey, weathering dark grey, bedding planar to slightly wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; featureless bed with some faint laminations that follow the contours of the bases of beds (perhaps these are fine grained allodapic calcilutites); some black chert has partly replaced some of these beds; intervals less than 1 m thick of these beds occur within the dolostone of this unit; this unit ends on a knob; basal contact gradational, continuous.	76.5	(251.0)	668.0	
9	Limestone (50 per cent exposed): slightly recessive; argillaceous calcilutite; dark grey to medium brownish red, weathering medium- to dark-grey and pink; bedding planar, mode thin bedded, minimum medium bedded, maximum very thin bedded; many beds are couplets of dark grey calcilutite with thin partings of pink shale and siltstone; calcareous siltstone laminae have planar bases but wavy tops; siltstone forms a very small part of this unit; calcilutite beds are extremely planar; basal contact gradational, continuous.	61.5	(201.8)	591.5	
8	Dolostone (40 per cent exposed): slightly recessive; argillaceous and finely crystalline; medium grey, weathering light grey to yellowish grey; bedding planar and smooth,				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	mode thin bedded, minimum very thin bedded, maximum thin bedded; platy dolomite with yellow silty partings, weakly laminated, this unit ends on the top of a rise; basal contact gradational, continuous.	43.0	(147.6)	530.0	
7	Dolostone (10 per cent exposed): mainly a scree slope with siltstone and calcilutite as in underlying unit; basal contact gradational, continuous.	46.5	(152.6)	485.0	
6	Siltstone and limestone (50 per cent exposed, 85 per cent siltstone, 15 per cent limestone).				
	Siltstone: slightly recessive; dolomitic; minimum class clay, modal class silt; medium brownish red, weathering pink to light yellowish brown; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; platy and finely but faintly laminated, some silty dolomite; graptolites and criconariids are common on bed surfaces.				
	Limestone: slightly resistant; calcilutite; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; occurs as single interbeds or as groups of a few beds within the dolomitic siltstone; this unit occurs at the base of the pink shale facies of the Cadillac Formation.				
	Basal contact gradational, continuous. GSC locs. C-05778, C-05779 (see Appendix 2).	55.5	(182.1)	438.5	
5	Siltstone and dolostone (98 per cent siltstone, 2 per cent dolostone, dolomitic impure quartzarenite).				
	Siltstone: moderately resistant; minimum class clay, modal class silt; medium brownish orange, weathering orange; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; platy and laminated; lighter laminae are coarse silt and fine sand; a few medium beds of nonlaminated orange dolomitic siltstone and fine sandstone.				
	Dolostone: resistant; finely crystalline; dark grey, weathering dark grey; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum thin bedded; occurs as two beds of dolomitized calcilutite; this unit ends in a prominent saddle.				
	Basal contact gradational, continuous.	135.0	(442.9)	383.0	
4	Siltstone and limestone (60 per cent exposed, 90 per cent siltstone, 10 per cent limestone, impure quartzarenite).				
	Siltstone: moderately resistant; dolomitic and calcareous; minimum class clay, modal class silt; medium yellowish brown, weathering yellow; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; platy, argillaceous and silty.				
	Limestone: moderately resistant; fossiliferous wackestone; dark to medium grey, weathering medium- to dark-grey; bedding planar, mode thin bedded minimum very thin bedded, maximum medium bedded; crinoid and coral-bearing wackestones that may be debris flows as fossil fragments tend to be oriented parallel to bedding; some very large crinoid ossicles are present; thinner beds are darker; unit ends on the top of a hill.				
	Basal contact gradational, continuous.	78.0	(255.9)	248.0	
3	Siltstone (40 per cent exposed): same as overlying unit but less well exposed and more vegetated; basal contact abrupt.	51.5	(169.0)	170.0	
	Total thickness of the Cadillac Formation is 701.5 m (2301.5 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Road River Formation				
2	Limestone (20 per cent exposed): recessive; argillaceous calcilutite; dark greyish brown, weathering yellow; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum thin bedded; faintly laminated and platy, light laminations are silty; some calcareous shale, most of unit is in a saddle between hills; basal contact gradational.	64.5	(21.6)	118.5	(389.0)
1	Limestone (10 per cent exposed): same as overlying unit but even less exposed, a few 5 cm thick yellow silty interbeds.	54.0	(177.2)	54.0	
	Incomplete thickness of the Road River Formation is 118.5 m (388.8 ft).				
	Total thickness of the South Manetoe 2 Section is 1179.0 m (3868.1 ft).				

SOUTH MANETOE 1 SECTION

SECTION 6. This is a west-dipping section that begins at Lat. 61°38'N; Long. 125°10'W (or 6834500N, 385200E in UTM coordinates). It extends westward across the south end of the Manetoe Range in the north-central part of the Virginia Falls map area (96F) in the District of Mackenzie, N.W.T. The section is best shown in air photo A17440-025. It contains the type section of the Sombre detrital member and a reference section of the pink shale member of the Cadillac Formation.

	Headless Formation				
24	Limestone: recessive; argillaceous calcilutite; dark greenish grey, weathering medium greenish grey; bedding wavy to nodular, mode medium bedded, minimum very thin bedded, maximum medium bedded; rubbly weathering with abundant, green, argillaceous material; sparsely scattered crinoids and brachiopods; basal contact abrupt.	6.4	(21.0)	999.9	(3280.5)
	Incomplete thickness of Headless Formation is 6.4 m (21.0 ft).				
	Funeral Formation				
23	Limestone: slightly recessive; argillaceous wackestone and mudstone; medium brown, weathering medium yellowish brown to yellowish grey; bedding planar, to slightly wavy, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant, recessive, silty and argillaceous partings; basal contact gradational, continuous.	30.0	(98.4)	993.5	(3259.5)
22	Shale: recessive; minimum class clay, modal class clay, maximum 5 per cent 0.06 mm; brown, weathering yellow; bedding planar, mode thinly laminated minimum thinly laminated, maximum laminated; platy and calcareous; a few, scattered, 10 cm thick, resistant beds of lime mudstone; basal contact gradational, continuous.	51.0	(167.3)	963.5	
21	Limestone A and limestone B (50 per cent limestone A, 50 per cent limestone B).				
	Limestone A: resistant; slightly argillaceous calcilutite; medium brownish grey, weathering medium brown to yellowish brown with yellow mottling; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; limestone A forms two resistant cliffs at the top and bottom of the unit.				
	Limestone B: recessive; argillaceous calcilutite; medium yellowish brown, weathering yellow; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; limestone B forms a recessive interval in the centre of the unit.				
	Basal contact gradational, continuous.	19.5	(64.0)	912.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
20	Shale (40 per cent exposed): recessive and calcareous; minimum class clay, modal class clay, maximum 5 per cent 0.05 mm; medium brownish yellow, weathering yellow; mode thinly laminated, minimum thinly laminated, maximum laminated; basal contact abrupt.	39.0	(128.0)	893.0	
	Total thickness of the Funeral Formation is 139.5 m (457.7 ft).				
	Sombre Formation (*detrital member*)				
19	Limestone (80 per cent exposed): resistant; dolomitic wackestone; dark grey, weathering dark- to medium-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; crinoids (abundant *Gasterocoma bicoula*) and corals abundant; basal contact gradational, continuous.	10.5	(34.5)	854.0	(2801.8)
18	Dolostone (40 per cent exposed): resistant; finely crystalline; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant, light grey, millimetre-sized intraclasts; basal contact gradational, continuous.	62.0	(203.4)	843.5	
17	Limestone: resistant; fossiliferous packstone; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum thick bedded; crinoidal and intraclast packstone and grainstone mass flow deposits but grading not evident; intraclasts 1-5 mm long; basal contact gradational, continuous.	51.0	(167.3)	781.5	
16	Limestone and dolostone (80 per cent exposed, 90 per cent limestone, 10 per cent dolostone).				
	Limestone: resistant; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum medium bedded, maximum thick bedded; grainstone beds containing abundant rounded intraclasts 1-5 mm long; intraclasts are crudely oriented parallel to bedding.				
	Dolostone: resistant; finely crystalline; dark brownish grey, weathering medium brownish grey; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum thin bedded; some black chert nodules and partly silicified beds.				
	Basal contact gradational, continuous.	40.0	(131.2)	730.5	
15	Limestone: resistant; medium grey, weathering light grey; bedding planar and smooth, mode very thin bedded, minimum very thin bedded, maximum medium bedded; intraclast-bearing grainstone beds alternate with mudstone beds, a few scattered crinoids, basal contact gradational, continuous.	28.5	(93.5)	690.5	
14	Limestone: resistant; medium grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; intraclast and crinoid grainstone and packstone; bases of individual beds are erosional with ripped-up platy clasts from the underlying beds particularly of dark grey calcilutite beds that are scattered throughout the unit; basal contact gradational, continuous. GSC loc. C-059358 (see Appendix 2).	39.0	(128.0)	662.0	
13	Limestone: moderately resistant; medium grey, weathering light grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum thick bedded; intraclastic and crinoidal grainstones and wackestones; intraclasts and crinoids are oriented parallel to bedding; basal contact gradational, continuous.	18.0	(59.1)	623.0	
12	Limestone: moderately resistant; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; graded beds of light grey intraclasts in darker grey lime mud grains up to 1 cm long display preferential alignment parallel to bedding; basal contact gradational, continuous.	51.5	(169.0)	605.0	
11	Limestone: moderately resistant; dark to medium grey, weathering dark to light grey; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; a few beds of light grey intraclastic grainstone interspersed throughout dark grey wackestone beds, some centimetre-sized fragments floating in a matrix of millimetre-sized grains (crinoids and brachiopods fragments); basal contact gradational, continuous.	49.5	(162.4)	553.4	
	Total thickness of the Sombre Formation (detrital member) is 350.0 m (1148.3 ft).				
	Cadillac Formation				
10	Limestone and siltstone (90 per cent exposed, 95 per cent limestone, 5 per cent siltstone).				
	Limestone: resistant; dark- to medium-grey; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; thicker beds are graded, intraclast-bearing packstones and wackestone that are very smoothly bedded, thinner beds tend to be wavy.				
	Siltstone: recessive; minimum class clay, modal class silt; dark- to medium-pinkish grey; bedding planar, mode laminated, minimum thinly laminated, maximum very thin bedded; calcareous; some faint laminations; in part a silty limestone.				
	Basal contact abrupt. GSC loc. C-059351 (see Appendix 2).	76.5	(251.0)	504.0	(1653.5)
9	Siltstone and limestone (84 per cent siltstone, 15 per cent limestone).				
	Siltstone: recessive; minimum class clay; dark to medium pinkish-grey; weathering medium pinkish grey to pink; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; calcareous with some faint colour laminations; one medium bed of brown weathering, calcareous, fine sandstone in the middle of the unit.				
	Limestone: moderately resistant; medium to dark grey, weathering medium grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; crinoidal wackestone beds interbedded with darker grey calcilutite beds; intervals of limestone several metres thick are interbedded with siltstones; some irregular to nodular dark grey chert masses.				
	Basal contact gradational, continuous.	22.0	(72.2)	427.5	
8	Limestone and siltstone (90 per cent limestone, 10 per cent siltstone).				
	Limestone: moderately resistant; medium- to dark-grey weathering medium- to dark-grey; bedding planar to wavy and smooth, mode thin bedded, minimum laminated, maximum thin medium bedded; crinoid wackestone beds alternate with dark grey calcilutite beds; some flow rolls and/or convolute bedding in calcilutite beds overlain by crinoidal beds; some chert nodules and irregular silicification.				
	Siltstone: recessive; minimum class clay, modal class silt; medium pinkish brown, weathering medium pink; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; pink calcareous with some faint colour				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	lamination; pink siltstone occurs in intervals 0.5-1.5 m thick interbedded with limestone.				
	Basal contact gradational, continuous.	51.0	(167.3)	405.5	
7	Limestone (80 per cent exposed): resistant; grey, crinoidal wackestone; bedding wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; some pink calcareous siltstone at base of unit; basal contact gradational, continuous.	31.5	(103.3)	354.5	
6	Siltstone and limestone (50 per cent exposed, 60 per cent siltstone, 40 per cent limestone, dolomite cemented impure quartzarenite).				
	Siltstone: recessive; minimum class clay, modal class silt; medium orangish to pinkish brown, weathering brownish orange and pink; bedding planar, mode laminated, minimum laminated, maximum very thin bedded.				
	Limestone: slightly calcareous and platy; resistant; dark grey, weathering dark grey; bedding wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; slightly crinoidal and faintly graded with some flow rolls; several 1.0 m thick interbeds of limestone in this unit; some irregular chert masses.				
	Basal contact gradational, continuous.	66.0	(216.5)	323.0	
5	Siltstone (80 per cent exposed): dolomitic; recessive; minimum class clay, modal class silt; brownish orange, weathering medium orange; bedding planar and smooth, mode very thin bedded, minimum laminated, maximum thin bedded; finely laminated; basal contact abrupt.	72.0	(236.2)	257.0	
4	Limestone (20 per cent exposed): resistant; dark grey, weathering dark grey; bedding planar and uneven, mode medium bedded, minimum very thin bedded, maximum medium bedded; crinoidal wackestone with some *Cornites* or thamnoporid-like corals; recessive, siltstone or silty limestone probably occupies the covered intervals in this unit; basal contact abrupt.	15.5	(50.9)	185.0	
	Total thickness of the Cadillac Formation is 334.5 m (1097.4 ft).				
	Road River Formation				
3	Limestone (5 per cent exposed): recessive; argillaceous calcilutite; medium yellowish grey, weathering light yellowish grey to yellow; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; basal contact gradational, continuous.	105.0	(344.5)	169.5	(556.1)
2	Limestone: recessive; argillaceous calcilutite; medium yellowish grey, weathering light yellowish grey to yellow; mode thin bedded, minimum laminated, maximum thin bedded; almost a shale in places; basal contact gradational, continuous. GSC loc. C-059338 (see Appendix 2).	19.5	(64.0)	64.5	
1	Limestone (80 per cent exposed): recessive; argillaceous calcilutite; medium yellowish grey, weathering light yellowish grey to yellow; bedding wavy, mode thin bedded, minimum laminated, maximum thin bedded; some scattered thin silty seams; individual thin and laminated beds tend to be rhythmic with less argillaceous, greyer weathering calcilutite grading upwards to more argillaceous and yellow weathering calcilutite.	45.0	(147.6)	45.0	
	Incomplete thickness of the Road River Formation is 169.5 m (556.1 ft).				
	Total thickness of the South Manetoe Section is 999.9 m (3280.5 ft).				

MANETOE RANGE I SECTION

SECTION 7. This is a west-dipping section that begins at Lat. 61°46'N; Long. 125°06'W (or 6848700N; 389000E in UTM coordinates). It extends westward across the Manetoe Range in the northwest part of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It is shown in RCAF air photo A17041-084. This section contains the type section of the Vera Formation.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
20	Limestone: resistant; coralline wackestone; medium- to light-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; large colonial corals scattered throughout with some in place, but others appear to have rolled; basal contact gradational, continuous.	45.0	(147.6)	1207.0	(3960.0)
	Incomplete thickness of the Nahanni Formation is 45.0 m (147.6 ft).				
	Headless Formation				
19	Limestone: slightly recessive; argillaceous wackestone; medium grey to greenish grey, weathering medium greenish grey; bedding lenticular to wavy, uniformly thin bedded; some interbeds of coarsely crystalline white dolomite of the Manetoe facies; scattered brachiopods, crinoids and coral fragments; basal contact abrupt.	18.0	(59.1)	1162.0	(3812.3)
	Total thickness of the Headless Formation is 18.0 m (59.1 ft).				
	Landry Formation				
18	Limestone and dolostone (50 per cent limestone, 50 per cent dolostone).				
	Limestone: resistant; pelletal wackestone; dark grey, weathering medium grey; bedding wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; slightly argillaceous; a few colonial corals; this unit is hard to differentiate from the overlying Headless Formation but is here assigned to the Landry Formation.				
	Dolostone: resistant; coarsely crystalline; white to light grey, weathering white; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded, occurs as interbeds within the limestone.				
	Basal contact gradational. Continuous part of this unit is the Manetoe facies dolomite.	60.0	(196.9)	1144.0	(3753.3)
	Total thickness of the Landry Formation is 60.0 m (196.9 ft).				
	Sombre Formation				
17	This unit is the same as the underlying unit but is less well exposed, very light grey and crinoidal; basal contact gradational, continuous.	45.0	(147.6)	1084.0	(3556.4)
16	Dolostone (80 per cent exposed): resistant to slightly recessive; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; crinoidal; this unit forms a more recessive interval along the ridge crest; basal contact gradational, continuous.	48.0	(157.5)	1039.0	
15	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum nonbedded; very homogeneous; some solution-collapse breccia infilled with coarsely crystalline white dolomite and dogtooth quartz; basal contact gradational, continuous.	78.0	(255.9)	991.0	
14	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering medium- to light-grey; bedding planar, mode thick bedded,				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	minimum thick bedded, maximum very thick bedded; light grey and medium grey dolomite are interbedded; top of unit is in the lowest saddle along the ridge; basal contact gradational, continuous.	21.0	(68.9)	913.0	
13	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded, homogeneous and uniformly bedded; some very large cavity fillings up to several metres across of white, coarsely crystalline dolomite, quartz and calcite; some amethyst quartz in vug-fillings; basal contact gradational, continuous.	78.0	(255.9)	892.0	
12	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; medium and light grey dolomite are interbedded; some fenestral fabric in light grey beds, a few hemispherical stromatoporoids in medium grey beds; good moldic (biogenic), vuggy porosity; unit exposed along a ridge crest; basal contact gradational, continuous.	45.0	(147.6)	814.0	
11	Dolostone: resistant; finely crystalline; medium- to dark-grey, weathering light- to medium-grey; bedding planar, mode thick. bedded, minimum thick bedded, maximum very thick bedded; dark crinoidal dolomite interbedded with medium grey, vuggy dolomite and light grey dolomite containing fenestral fabric; a few light grey beds contain some laminated, slightly argillaceous and yellow intervals; unit ends at the top of the hill; basal contact gradational, continuous.	91.5	(300.2)	769.0	
10	Dolostone (40 per cent exposed): slightly recessive; finely crystalline; dark- to medium-grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; dark, crinoidal dolomite in the lower part of the unit passes upward to medium grey vuggy dolomite with moldic porosity; basal contact gradational, continuous.	72.0	(236.2)	677.5	
9	Dolostone: resistant; finely crystalline; light grey, weathering very light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; homogeneous but some beds are vuggy; a little breccia with carbonate mud-supported angular fragments (a penecontemporaneous breccia?); unit begins in a saddle leading towards a high point; basal contact gradational, continuous.	61.0	(200.1)	605.5	
8	Dolostone: resistant; finely crystalline; medium grey, weathering medium- to light-grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; homogeneous but with a tendency for discontinuous partings to be concentrated in the upper parts of beds; some finely brecciated beds infilled with white coarsely crystalline dolomite; basal contact gradational, continuous.	102.0	(334.6)	544.5	
7	Dolostone: resistant; finely- to medium-crystalline; dark- to light-grey, weathering medium- to light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; lower part of the unit is dark grey, crinoidal dolostone that contains some solution-collapse breccia; upper part is thinner bedded and light grey; basal contact abrupt.	45.0	(147.6)	442.5	
	Total thickness of the Sombre Formation is 686.5 m (2252.3 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Vera Formation				
6	Dolostone (40 per cent exposed): slightly recessive; finely crystalline; dark grey and brownish grey, weathering medium brownish grey with faint yellow weathering argillaceous partings; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; stringers of crinoid fragments parallel to bedding; basal contact gradational, continuous.	75.0	(246.1)	397.5	(1304.1)
5	Siltstone and limestone (60 per cent exposed; 70 per cent siltstone, 30 per cent limestone). Siltstone: moderately recessive and calcareous; modal class silt, minimum class clay; dark brown, weathering medium brown; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; platy with dark brown argillaceous partings. Limestone: moderately resistant; wackestone; dark grey, weathering medium yellowish brown and grey; bedding planar but uneven and tending to be crinkled in places, mode thin bedded, minimum very thin bedded, maximum thin bedded; some pockets of argillaceous material that weather yellow, some skeletal debris (mainly brachiopods). Basal contact gradational, continuous.	60.0	(196.9)	322.5	
4	Limestone: moderately resistant; calcilutite; dark brownish grey, weathering medium- to light-brown grey; bedding planar to slightly lenticular, mode very thin bedded, minimum laminated, maximum very thin bedded; silty and argillaceous with scattered brachiopods, including *Orbiculoidea*; some yellowish brown argillaceous partings; unit ends at a bench in the side of the hill; basal contact gradational, continuous. Identified fauna in GSC loc. C-059318 (see Appendix 2).	69.0	(226.4)	262.5	
3	Limestone: moderately resistant; wackestone; medium yellowish grey, weathering medium yellowish grey; bedding wavy to irregular, mode thin bedded, minimum very thin bedded, maximum thin bedded; some yellow, argillaceous partings rythmically alternate with grey wackestone within beds; scattered crinoids and gastropods; basal contact gradational, continuous.	67.5	(221.5)	193.5	
	Total thickness of the Vera Formation is 271.5 m (890.7 ft).				
	Road River Formation				
2	Limestone: resistant; argillaceous calcilutite; dark- to medium-brownish grey, weathering medium yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; thin couplets typical of Road River where yellow silty and argillaceous seams alternate with grey calcilutite; thicker beds are less argillaceous; basal contact gradational, continuous.	57.0	(187.0)	126.0	(413.4)
1	Limestone (80 per cent exposed): slightly recessive; argillaceous calcilutite; medium brownish grey, weathering yellowish grey; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy with argillaceous and silty partings; thicker beds are less argillaceous; basal contact gradational, continuous.	69.0	(226.4)	69.0	
	Incomplete thickness of the Road River Formation is 126.0 m (413.4 ft).				
	Total thickness of the Manetoe Range 1 Section is 1207.0 m (3960.0 ft).				

MANETOE RANGE 2 SECTION

SECTION 8. This is a west-dipping section that begins at Lat. 61°54'N; Long. 125°00'W (or 6866250N, 394500E in UTM coordinates). It extends westward across the north end of the Manetoe Range in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. This section is best shown in air photo A17428-199.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation				
31	Limestone (50 per cent exposed): recessive; argillaceous, bituminous and fossiliferous wackestone; dark grey, weathering medium- to dark-grey mottled orange; bedding planar and irregular; an amphiporid and ramose colonial coral wackestone with a black, bituminous wackestone; some argillaceous material weathers orange; unit becomes lighter grey and is less argillaceous upward at or near the contact with the Nahanni Formation; unit goes over a hill and down a dip slope; basal contact abrupt.	120.0	(393.7)	1713.5	(5621.7)
30	Limestone: moderately resistant; argillaceous wackestone; medium- to dark-grey mottled with dark orange, weathering greyish and yellowish green mottled orange; bedding planar to irregular, mode very thin bedded, minimum very thin bedded, maximum thin bedded; orange weathering, limonitized burrows tend to be oriented parallel to bedding; a few intervals of wavy and lenticularly interbedded greyish green shale, some finely comminuted skeletal debris; basal contact gradational, continuous.	28.5	(93.5)	1593.5	
29	Limestone (70 per cent exposed): moderately resistant; bituminous and argillaceous wackestone; dark grey (black?), weathering dark grey with reddish orange mottlings; bedding planar to irregular, mode thin bedded, minimum very thin bedded, maximum thin bedded; unit ends in a saddle; basal contact abrupt.	90.0	(295.3)	1565.0	
	Incomplete thickness of Headless Formation is 238.5 m (782.5 ft).				
	Landry Formation				
28	Dolostone: very resistant; coarsely crystalline, with minor limestone; white- to light-grey, weathering white- to light-grey; bedding planar, mode very thick bedded, maximum nonbedded; white dolostone forms a homogeneous and resistant cliff in the upper part of the unit but one interbed of grey weathering, brown, pelletal wackestone occurs in the lower, less resistant part of the unit; basal contact gradational, continuous. This unit is part of the Manetoe facies.	82.5	(270.7)	1475.0	(4839.2)
27	Limestone: resistant; pelletal wackestone; dark- to light-brownish grey, weathering medium- to light-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; dark, brownish grey, bituminous and light grey wackestone are interbedded; some ochre staining on bed surfaces; a few wavy pelletal grainstone beds; one coarsely crystalline white dolostone bed; some silification of sparse fossil material; basal contact erosional.	85.5	(280.5)	1392.5	
26	Limestone and dolostone (70 per cent limestone, 30 per cent dolostone).				
	Limestone: resistant; pelletal wackestone; medium brown, weathering grey; bedding planar and smooth, mode medium bedded, minimum thin bedded, maximum medium bedded; some silicified ostracodes.				
	Dolostone: resistant; coarsely crystalline; white, weathering white, bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; dolomitized limestone beds interbedded with wackestone beds; only slightly vuggy; unit is exposed down a steep dip slope; basal contact gradational, continuous. Part of this unit is Manetoe facies dolostone.	19.5	(64.0)	1307.0	
	Total thickness of the Landry Formation is 187.5 m (615.2 ft).				
	Sombre Formation				
25	Dolostone: resistant; finely- to medium-crystalline; medium- to light-grey, weathering medium- to light-grey; bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; medium grey, thick beds of fossiliferous and vuggy dolomite grade upwards to light grey dolomite laminite; some solution-collapse breccia in more vuggy beds; basal contact gradational; continuous.	37.5	(123.0)	1287.5	(4224.1)
24	Dolostone (80 per cent exposed): slightly recessive; finely to very finely crystalline; light grey, weathering light grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; entire unit is dolomite laminite; basal contact gradational, continuous.	22.5	(73.8)	1250.0	
23	Dolostone: resistant; medium crystalline; dark greyish brown, weathering medium greyish brown to brownish grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; vuggy and bituminous; some solution-collapse breccias cemented with white dolomite; unit exposed over a hilltop; basal contact gradational, continuous.	49.5	(162.4)	1227.5	
22	Dolostone: resistant; medium to coarsely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; a bituminous, black wackestone with crinoids and corals that has recrystallized to coarse, sucrosic dolomite; a cliff-forming unit; basal contact gradational, continuous.	70.5	(231.3)	1178.0	
21	Dolostone (90 per cent exposed): resistant; medium crystalline; medium- to light-grey, weathering light grey to yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thick beds of slightly vuggy, grey dolostone grade upwards to yellowish grey dolomite laminite containing fenestral fabric; orange pods of dolostone breccia are common with some up to 3 m long and 1 m thick; angular dolomite clasts in a yellowish orange slightly silty dolomite matrix; this unit forms part of a prominent north-south ridge line; basal contact gradational, continuous.	24.0	(78.7)	1107.5	
20	Dolostone: resistant; finely crystalline; medium grey, weathering medium- to light-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thick, slightly vuggy and fossiliferous, grey dolomite beds grade upwards to nearly white weathering dolomite laminite; one or two interbeds of pelletal and intraclast lime grainstone at the base of thicker subtidal intervals; this unit leads up to a ridge crest; basal contact gradational, continuous.	115.5	(378.9)	1083.5	
19	Dolostone: resistant; medium crystalline; dark brownish grey, weathering dark to medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; massive and vuggy with abundant poorly preserved corals and/or stromatoporoids; this may be the middle dark band of the Sombre noted by Douglas and Norris (1961); unit extends along an east-west ridge; basal contact gradational, continuous.	34.5	(113.2)	968.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
18	Dolostone (20 per cent exposed): slightly to moderately recessive; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thin bedded, maximum thick bedded; very homogeneous with some thinner bedded intervals a yellowish grey to greyish yellow dolomite laminite; unit exposed in a saddle; basal contact gradational, continuous.	75.0	(246.1)	933.5	
17	Dolostone (80 per cent exposed): resistant; finely crystalline; light grey, weathering light- to very light-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; abundant, vuggy, biostromal intervals between lighter grey dolomite laminite beds; some vuggy beds (i.e. spaghetti stone) contain abundant molds of amphiporid-like fossils; this unit extends over a knob to a saddle; basal contact gradational, continuous.	66.0	(216.5)	858.5	
16	Dolostone (80 per cent exposed): resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded, homogeneous; thicker beds are a slightly darker grey; some solution-collapse breccia occurs at the base of the unit; basal contact gradational, continuous.	61.5	(201.8)	792.5	
	Total thickness of the Sombre Formation is 556.3 m (1825.8 ft).				
	Camsell Formation (*Corridor Member*)				
15	Dolostone (50 per cent exposed): slightly recessive; finely crystalline; medium yellow to dark brownish grey, weathering yellow to dark brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; lower part of unit is yellow, silty dolomite laminite whereas the upper part is yellow laminite interbedded with thick beds of dark grey dolomite; several intervals of breccia in the upper part of the unit in which angular light grey and yellow clasts float in a matrix of dark dolomitized wackestone; most of unit is a scree slope; basal contact gradational, continuous.	94.5	(310.0)	731.0	(2398.3)
14	Dolostone (40 per cent exposed): moderately resistant; finely crystalline; medium- to light-yellow, weathering light yellow; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; most of unit is dolomite laminite with stromatolites; one prominent channel 20 m wide and 2 m thick filled with homogeneous, medium grey, dolomitized calcilutite (a tidal channel?); some solution-collapse breccia cemented with coarsely crystalline white dolomite; basal contact gradational, continuous.	40.5	(132.9)	636.5	
13	Dolostone: moderately resistant; finely crystalline; medium- to light-brownish or yellowish grey, weathering light yellowish grey; bedding planar to wavy, mode nonbedded, minimum very thick bedded, maximum nonbedded; entire unit is a breccia with angular, poorly sorted clasts dispersed and floating within a dolomitized, grey, calcilutite matrix; most clasts several tens of centimetres long but elongate slabs up to 1.5 m long; very poor colour contrast between fragments and matrix; several poorly bedded but nonbrecciated intervals occur in this unit; top part of unit is down long dip slope; basal contact gradational, continuous.	25.5	(83.7)	596.0	
12	Dolostone: resistant; finely crystalline; light grey to brownish grey, weathering light grey to brownish grey; bedding planar to wavy, mode very thick bedded, minimum very thick bedded, maximum nonbedded; a breccia similar to that in overlying unit, many brownish grey laminated clasts in a grey matrix; clasts elongate to blocky and tend to be oriented parallel to bedding; basal contact gradational, continuous.	28.5	(93.5)	570.5	
11	Dolostone A and dolostone B (70 per cent dolostone A, 30 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; slightly fossiliferous.				
	Dolostone B: slightly recessive; argillaceous, finely crystalline; medium greenish and yellowish grey; weathering medium- to light-greenish and yellowish grey; bedding planar to slightly wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; thin intervals of dolostone B are interbedded with dolostone A.				
	Basal contact gradational, continuous.	80.0	(262.5)	542.0	
10	Dolostone (70 per cent exposed): moderately resistant; medium grey to yellow, weathering striped medium grey to yellow; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; several thick beds of medium grey alternate with intervals of yellow dolomite laminite; a little solution-collapse breccia in some medium grey beds; unit ends at at prominent bench near the top of a hill; basal contact gradational, continuous.	11.5	(37.7)	462.0	
9	Dolostone: moderately resistant; finely crystalline; yellow and grey, weathering yellowish orange with grey stripes; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; mainly yellow silty dolomite laminite interbedded with light grey, thin bedded dolostone, several thick beds of dark grey dolostone grade upwards to light grey dolostone, imparting a striped appearance to the unit; basal contact gradational, continuous.	74.8	(245.4)	450.5	
8	Dolostone: resistant; finely crsytalline; dark- to light-grey, weathering medium- to light-grey; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; thick beds of medium grey dolostone grade upwards to light grey dolomite laminite; some light grey beds have a faint yellow tint; basal contact gradational, continuous.	25.8	(84.7)	375.7	
7	Dolostone: resistant; finely crystalline; light and dark grey and yellow, weathering alternating light and dark grey striped with yellow; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; most of unit is composed of dark to light grey dolostone cycles with several thin recessive interbeds of yellow silty dolomite laminite; basal contact gradational, continuous.	13.7	(45.0)	349.9	
6	Dolostone: slightly recessive; finely crystalline; light grey, weathering light grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; mainly broken outcrop and talus of light grey dolomite blocks; a homogeneous unit of light grey faintly laminated dolomite; basal contact gradational, continuous.	16.0	(52.5)	336.2	
5	Dolostone: resistant; finely crystalline; light- to dark-grey and yellow, weathering light- to dark-grey with yellow stripes; mode thin bedded, minimum laminated, maximum thick bedded; predominantly light and dark grey dolostone with occasional thin interbeds of yellow siltstone; dark grey, slightly fossiliferous dolostone beds tend to sharply				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	overlie light grey dolomite laminites; basal contact gradational, continuous.	50.3	(165.1)	320.2	
4	Dolostone: moderately resistant; finely crystalline; yellow and grey, weathering yellow with light and dark grey stripes; mode thin bedded, minimum laminated, maximum thick bedded; predominantly yellow, silty dolomite laminite with subsidiary intervals several metres thick of interbedded light and dark grey dolostone; basal contact gradational, continuous.	44.7	(146.7)	269.9	
3	Dolostone: resistant; finely crystalline; light- to dark-grey banded yellow, weathering light and dark grey with yellow bands; bedding wavy, mode thin bedded, minimum laminated, maximum thick bedded, mainly interbedded dark and light dolostone with occasional metre-thick intervals of yellow silty dolomite laminite; scattered patches of solution-collapse and areas of mottling are common in the dark grey dolostone; some dark grey beds are slightly fossiliferous; light grey beds are faintly laminated and are overlain with sharp, erosional contacts by dark grey beds; yellow beds tend to have transitional contacts with light grey laminites; basal contact gradational, continuous.	34.7	(113.9)	225.2	
2	Dolostone A and dolostone B (20 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: moderately resistant; finely crystalline; light brownish grey to black, weathering light brownish grey to black; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; mainly light brownish grey with some thick interbeds of dark grey to black fetid dolostone containing vugs and silicified stromatoporoids.				
	Dolostone B: recessive; finely crystalline; medium yellow, weathering light yellow; bedding wavy to lenticular, mode very thin bedded, minimum laminated, maximum very thin bedded; platy and silty dolostone; occurs in several intervals near the top of the unit; this unit is poorly exposed because it is a flat slope overgrown with vegetation.				
	Basal contact gradational, continuous.	90.0	(295.3)	190.5	
1	Dolostone A and dolostone B (80 per cent dolostone A, 20 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium greyish brown, weathering light greyish brown to grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded, some vugs and a little solution-collapse breccia in this dolostone.				
	Dolostone B: recessive; finely crystalline; medium yellowish brown, weathering light yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy, argillaceous and silty; this occurs as thin interbeds within the darker dolostone.				
	Basal contact gradational, continuous.	100.5	(329.7)	100.5	
	Incomplete thickness of the Corridor Member of the Camsell Formation is 731.0 m (2398.3 ft).				
	Total thickness of the Manetoe Range 2 Section is 1713.5 m (5621.7 ft).				

WEST TUNDRA 2 SECTION

SECTION 9. This is an east-dipping reconnnaissance section that begins at Lat. 61°51'30"N; Long. 124°56'30"W between the northern parts of Tundra Ridge and the Manetoe Range in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. Thicknesses are estimated.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Arnica Formation *(basinal member)*				
7	Dolostone: moderately recessive; medium to coarsely crystalline; white to medium brownish grey, weathering pale yellow and grey; bedding indistinct, thick bedded, white Manetoe facies dolomite has replaced dark grey Arnica dolomite; basal contact gradational, continuous.	15.0	(49.2)	850.0	(2788.7)
6	Limestone: slightly recessive; argillaceous wackestone or calcilutite; dark grey, weathering dark grey; bedding planar, thin- to medium-bedded and laminated; shaly partings 1 cm thick separate thin limestone beds; basal contact gradational, continuous.	45.0	(147.6)	835.0	
5	Dolostone: slightly recessive; finely to medium crystalline; dark brownish grey to light grey, weathering dark brownish grey to light grey; bedding planar, thin- to medium-bedded; thin- to medium-bedded resistant intervals of light grey, dolomitized, crinoidal and intraclast packstone are interbedded with recessive dark brownish grey, faintly laminated dolostone; laminated, dark grey chert beds appear towards the top of the unit; some crinoidal packstone beds are graded; the southward continuation of this unit has a pink tint; basal contact gradational, continuous.	45.0	(147.6)	790.0	
4	Dolostone: moderately resistant; finely crystalline; dark grey, weathering dark grey; bedding planar, thin- to medium-bedding with silty partings, some silicified beds and patches; basal contact gradational, continuous.	45.0	(147.6)	745.0	
	Incomplete thickness of the Arnica Formation is 150.0 m (492.1 ft).				
	Sombre Formation *(detrital member)*				
3	Dolostone: moderately resistant; finely crystalline; medium to light grey, weathering light grey; bedding planar and sharp, thin- to medium-bedded; a dolomitized detrital grainstone or packstone with 1-4 mm long lime mudstone fragments; some crinoid and brachiopod hash; skeletal material partly silicified; some graded beds of grainstone, some dark grey dolomite laminite near the top of the unit; basal contact abrupt.	250.0	(820.2)	(700.0)	(2296.6)
	Total estimated thickness of the Sombre Formation is 250.0 m (820.2 ft).				
	Cadillac Formation				
2	Dolostone: recessive; silty, finely crystalline; medium brown, weathering light brown to yellowish brown; thin to laminated, smooth, planar bedding; silt seams weather as light laminae; thin to medium beds of fine quartzarenite sandstone are scattered throughout as individual beds; medium beds of graded skeletal grainstone containing platy intraclasts are also present; in general, these limestone debris flow deposits are coarser and thicker bedded in the lower part of the unit; basal contact sharp.	400.0	(1312.3)	450.0	(1476.4)
	Total estimated thickness of the Cadillac Formation is 400.0 m (1312.3 ft).				
	Road River Formation				
1	Limestone: recessive; argillaceous calcilutite; medium grey to yellowish grey, weathering yellow				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	and greyish yellow; bedding thin and planar; yellow weathering argillaceous partings alternate with light grey calcilutite in single bed couplets.	50.0	(164.0)	50.0	(164.0)
	Incomplete thickness of the Road River Formation is 50.0 m (164.0 ft).				
	Total estimated thickness of the West Tundra 2 Section is 850.0 m (2788.7 ft).				

FUNERAL RANGE I SECTION

SECTION 10. This is a west-dipping section that begins at Lat. 61°37'N; Long. 124°53'W (or 6833650N, 400400E in UTM coordinates). The section extends westward across the Funeral Range in the north-central part of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is well shown in RCAF air photo A:17440-028.

Arnica Formation

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
19	Limestone (40 per cent exposed): resistant; calcilutite; dark grey, weathering dark- to medium-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thick bedded; some crinoids; possibly some graded pelletal calcilutite, abundant, black chert nodules and discontinuous beds; basal contact not noted; a fault of unknown but probably minor displacement separates this unit from the underlying unit.	135.0	(442.9)	711.5	(2334.3)
	Incomplete thickness of the Arnica Formation is 135.0 m (442.9 ft).				
	Probable fault contact.				

Cadillac Formation

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
18	Sandstone (80 per cent exposed): moderately recessive; modal class fine sand, minimum class silt; medium grey to yellowish grey, weathering orange; bedding planar to wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy and slightly friable; dolomite cement; basal contact gradational, continuous.	3.5	(11.5)	576.5	(1891.4)
17	Sandstone and limestone (70 per cent exposed, 95 per cent sandstone, 5 per cent limestone).				
	Sandstone: slightly recessive; modal class fine sand, minimum class clay; greyish orange, weathering orange; bedding planar, smooth and distinct, mode thin bedded, minimum laminated, maximum thin bedded; silty and hematitic, variably pelletal with dolomitized pellets in impure quartzarenite; dolomite cemented with a few small ripples.				
	Limestone: coralline; wackestone; medium grey, weathering medium grey; bedding wavy, mode medium bedded, minimum thin bedded, maximum medium bedded; this limestone occurs as scattered bioherms that are 10 m broad in the sandstone of this unit; abundant silicified corals and stromatoporoids and a few black chert nodules.				
	Basal contact abrupt.	48.0	(157.5)	573.0	
16	Same as in underlying unit but with some grey, crinoidal wackstone beds; basal contact gradational, continuous.	52.5	(172.2)	525.0	
15	Limestone and siltstone (90 per cent limestone, 10 per cent siltstone).				
	Limestone: slightly resistant; argillaceous and silty, pelletal lime wackestone; dark grey, weathering medium- to dark-grey; bedding planar, smooth and distinct, mode thin bedded, minimum very thin bedded, maximum medium bedded; slightly ripple marked.				
	Siltstone: slightly recessive; modal class silt, minimum class clay; medium greyish brown, weathering orange; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; platy and argillaceous; intimately interbedded with the calcilutite of this unit.				
	Basal contact gradational, continuous. This unit reaches the summit of the hill.	30.0	(98.4)	472.5	
14	Limestone: recessive; calcilutite; medium greyish brown, weathering orange; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; platy, argillaceous and silty; almost a siltstone in places, basal contact gradational, continuous.	9.0	(29.5)	442.5	
13	Limestone (70 per cent exposed): slightly resistant; wackestone; medium grey, weathering medium grey to yellowish orange; bedding wavy, mode thin bedded, minimum very thin bedded, maximum medium bedded; argillaceous with abundant brachiopods and trilobites; yellowish orange limestones are more argillaceous and silty; basal contact gradational, continuous. GSC loc. C-059281 (see Appendix 2).	55.5	(182.0)	433.5	
12	Siltstone (80 per cent exposed): slightly resistant; modal class silt, minimum class clay, maximum 5 per cent 0.1 mm; medium greyish green, weathering orange, yellow and pink; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; argillaceous content decreases and bedding becomes thicker upwards; some straight-crested and interference-type ripples; unit becomes more resistant upwards; basal contact gradational, continuous.	52.5	(172.2)	378.0	
11	Siltstone and limestone (50 per cent exposed, 80 per cent siltstone, 20 per cent limestone).				
	Siltstone: recessive base and resistant top; modal class silt, minimum class clay, maximum 5 per cent 0.1 mm; medium grey, weathering orange; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; platy and calcareous; recessive lower part of unit grades upward to resistant upper part.				
	Limestone: cherty; calcilutite; dark grey, weathering dark grey; bedding planar, mode thin bedded, minimum very thin bedded; calcilutite occurs as less than 1 m thick beds interbedded with orange siltstone.				
	Basal contact gradational, continuous.	66.0	(216.5)	325.5	
10	Limestone (30 per cent exposed): recessive; argillaceous calcilutite; dark grey, weathering light grey to yellow; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; almost a shale in more yellow weathering beds; basal contact gradational, continuous.	25.5	(83.7)	259.4	
9	Siltstone (80 per cent exposed): pelletal impure quartzarenite; modal class silt, minimum class clay, maximum 5 per cent 0.1 mm; bedding planar and distinct, mode very thin bedded, minimum laminated, maximum thin bedded; very platy; orange weathering, calcareous siltstone with a few interbeds of dark grey calcilutite; basal contact gradational, continuous. GSC loc. C-059275 (see Appendix 2).	19.5	(64.0)	234.0	
8	Siltstone and limestone (30 per cent exposed, 80 per cent siltstone, 20 per cent limestone).				
	Siltstone: recessive; pelletal impure quartzarenite; modal class silt, minimum class clay, maximum 5 per cent 0.1 mm; medium grey, weathering yellowish grey to				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; almost a silty limestone, weakly laminated and argillaceous; some poorly preserved fish heads and graptolites at 2.0 m.				
	Limestone: slightly resistant; argillaceous calcilutite; dark grey, weathering medium grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; interbedded with orange siltstone; some straight cephalopods and poorly preserved graptolites.				
	Basal contact gradational, continuous.	46.5	(152.6)	214.5	
	Incomplete thickness of the Cadillac Formation is 408.5 m (1340.2 ft).				
	Road River Formation				
7	Limestone and shale (30 per cent exposed, 90 per cent limestone, 10 per cent shale).				
	Limestone: recessive; argillaceous calcilutite; dark grey, weathering yellowish grey to yellow; bedding planar, smooth and distinct, mode laminated, maximum very thin bedded.				
	Shale: recessive and calcareous; modal class clay, minimum class clay, maximum 5 per cent 0.06 mm; black, weathering yellow; bedding planar, mode thinly laminated, minimum thinly laminated, maximum thinly laminated.				
	Basal contact gradational, continuous. GSC locs. C-059271, C-059272 (see Appendix 2).	63.0	(206.7)	168.0	(551.2)
6	Limestone (5 per cent exposed): recessive; argillaceous calcilutite; medium- to dark-grey, weathering light grey and yellowish grey; bedding planar, mode very thin bedded, minimum thinly laminated, maximum thin bedded; faintly laminated and platy; basal contact gradational, continuous.	10.5	(34.4)	105.0	
5	Dolostone (20 per cent exposed): moderately recessive; argillaceous; medium grey, weathering light grey; bedding planar, mode very thin bedded, minimum thinly laminated, maximum thin bedded; thicker bedded dolomite is silty; basal contact gradational, continuous.	21.0	(68.9)	94.5	
4	Dolostone A and dolostone B (50 per cent exposed, 95 per cent dolostone A, 5 per cent dolostone B).				
	Dolostone A: recessive; silty, finely crystalline; light- to medium-grey, weathering light yellowish orange and pinkish grey; bedding planar and distinct, mode very thin bedded, minimum laminated, maximum thin bedded; some sponge spicules scattered on bed surfaces (tetraxons?).				
	Dolostone B: resistant, finely crystalline; dark brown, weathering dark brown; bedding planar, mode thin bedded, minimum thin bedded; some thin black chert bands and nodules.				
	Basal contact gradational, continuous.	7.5	(24.6)	73.5	
3	Dolostone (100 per cent exposed): slightly resistant; finely crystalline; dark brown; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; abundant, discontinuous, laminar, black chert nodules (3-10 cm thick); faintly laminated dolomite; basal contact abrupt.	6.0	(19.7)	66.0	
2	Dolostone A and dolostone B (40 per cent exposed, 60 per cent dolostone A, 40 per cent dolostone B).				
	Dolostone A: recessive; finely crystalline; light grey, weathering light grey to silver; bedding planar mode laminated, minimum thinly laminated, maximum very thin bedded; very fissile; abundant and platy, argillaceous and calcareous graptolites and small brachiopods.				
	Dolostone B: slightly resistant; silty, finely crystalline; light grey to cream, weathering light yellow to orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; laminated; some almost a dolomitic siltstone.				
	Basal contact gradational, continuous (GSC loc. C-059265 (see Appendix 2).	13.5	(44.3)	60.0	
1	Dolostone A and dolostone B (20 per cent exposed, 80 per cent dolostone A, 20 per cent dolostone B).				
	Dolostone A: recessive; argillaceous, finely crystalline; medium grey, weathering light to medium grey; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and calcareous.				
	Dolostone B: dark greyish brown, weathering dark brown; bedding wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; abundant, laminar, black chert nodules and discontinuous beds.				
	Basal contract gradational, continuous. GSC loc. C-059263 (see Appendix 2).	46.5	(152.6)	46.5	
	Incomplete thickness of the Road River Formation is 168.0 m (551.2 ft).				
	Total thickness of the Funeral Range 1 Section is 711.5 m (2334.3 ft).				

PRAIRIE CREEK 4 SECTION

SECTION 11. This is a west-dipping section that begins near the junction of Cadillac Creek and Prairie Creek at Lat. 61°33'N; Long. 124°47'W (or 6823500N; 405000E in UTM coordinates). It extends westward across a ridge beside Cadillac Creek in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It is best seen in RCAF air photo A17428-020. This section includes the type section of the Cadillac Formation.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
40	Limestone: resistant; medium grey weathering; medium- to dark-grey (slightly bituminous), fossiliferous wackestone with moderately abundant corals; medium planar to irregular bedding with a few thick beds; only 40 per cent exposed but a prominent cliff-former nonetheless, with blocky talus.	79.5	(260.8)	2502.0	(8208.7)
	Incomplete thickness of the Nahanni Formation is 79.5 m (260.8 ft).				
	Headless Formation				
39	Limestone (40 per cent exposed): moderately recessive; medium- to dark-greenish grey weathering with light green and orange colour mottlings; thin- to very thin-nodular bedding; an argillaceous and fossiliferous wackestone with abundant brachiopods.	50.0	(164.1)	2422.5	(7947.8)
38	Limestone (20 per cent exposed): very recessive; medium- to dark-greenish grey weathering; thin- to very thin-irregular- to nodular-bedding; an argillaceous and fossiliferous wackestone with abundant brachiopods (e.g. *Schuchertella* and *Schizophoria* - A.W. Norris, pers. comm.), trilobites (*Dechenella* - A.W. Norris, pers. comm.), crinoids (*Amphocoelia*) and tentaculites; very rubbly weathering.	72.0	(236.2)	2372.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
37	Limestone (5 per cent exposed): very recessive; medium greyish green weathering; laminated to very thin, planar to lenticular bedding; fossiliferous, dark grey calcilutite with shell hash beds interbedded with unfossiliferous beds.	73.5	(241.1)	2300.5	
36	Limestone (5 per cent exposed): very recessive; light greenish grey weathering; laminated planar to lenticular bedding; lenticular bedding caused by small imbricated ripples separated by green, argillaceous seams; medium grey calcilutite.	23.5	(77.1)	2227.0	
35	Siltstone (5 per cent exposed): very recessive; yellow weathering, grey calcareous siltstone (some silty limestone); very thin, planar to lenticular bedding; one prominent outcrop at the end of the unit; unit begins near the base of a north-south saddle.	31.0	(101.7)	2203.5	
	Total thickness of the Headless Formation is 250.0 m (82.1 ft). Thickness may not be accurate above the base of the Headless Formation.				
	Landry Formation				
34	Limestone: resistant; pelletal calcilutite; medium- to dark-grey, weathering medium grey; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and even bed partings; this unit is overlain by greenish grey argillaceous limestone of the Headless Formation; basal contact abrupt.	22.0	(72.2)	2172.5	(7127.6)
	Total thickness of the Landry Formation is 22.0 m (72.2 ft).				
	Funeral Formation				
33	Siltstone: moderately resistant to recessive; minimum class clay, matrix more than 20 per cent, modal class silt; medium- to dark-brown, weathering light- to medium-brown; bedding planar, mode thinly laminated, minimum thinly laminated, maximum thinly laminated; calcareous and platy with some tentaculites and cephalopods; this unit, plus the overlying Landry, forms a slight topographic knob leading up to the Headless shaly limestone; basal contact gradational, continuous.	21.0	(68.9)	2150.0	(7053.8)
32	Shale (30 per cent exposed): recessive; minimum class clay, matrix more than 20 per cent, modal class clay, maximum 5 per cent silt; medium-to dark-brown, weathering medium brown; bedding planar, mode very thin bedded, minimum thinly laminated, maximum thin bedded; calcareous and platy; several 0.5 m thick, recessive interbeds of nodular, silty mudstone within this unit may be mass flow deposits as in the underlying unit; basal contact gradational, continuous.	37.0	(121.4)	2138.5	
31	Siltstone A and siltstone B (60 per cent siltstone A, 40 per cent siltstone B).				
	Siltstone A: shaly; moderately resistant to recessive; minimum class clay, matrix more than 20 per cent, modal class silt; medium brown, weathering light- to medium-brown; bedding wavy to lenticular, mode very thin bedded, minimum very thin bedded, maximum thin bedded; calcareous and platy; some tentaculites scattered on beds surfaces; lenticularly bedded intervals alternate with wavy, thin bedded intervals.				
	Siltstone B: resistant; minimum class clay, matrix more than 20 per cent, modal class silt; medium- to dark-brown, weathering light- to medium-brown; mode thin bedded, minimum thinly laminated, maximum thick bedded; eight medium to thick beds of homogeneous, vaguely nodular, argillaceous siltstone and mudstone grade upwards to platy, silty shale and siltstone and have sharp lower contacts (possible turbidite deposits?); this unit tends to be a resistant band within the Funeral.				
	Basal contact gradational, continuous.	10.5	(34.5)	2101.5	
30	Shale and siltstone (40 per cent exposed, 85 per cent shale, 15 per cent siltstone).				
	Shale: recessive; minimum class clay, matrix more than 20 per cent, modal class silt; dark brown, weathering yellowish grey to orangish yellow; bedding wavy, mode very thin bedded, maximum very thin bedded; calcareous and platy to flaggy parting; strongly cleaved; tentaculites on bed surfaces and a few crinoids.				
	Siltstone: shaly; minimum class clay, matrix more than 20 per cent, modal class silt, maximum 5 per cent 0.08 mm; medium brown, weathering light yellowish grey and yellowish brown; bedding planar, mode thinly laminated, minimum thinly laminated, maximum thinly laminated; calcareous and platy; many thin laminae appear to be graded couplets of fine sand grading upwards to shaly siltstone; some faint groove marks on base of some beds.				
	Basal contact gradational, continuous.	19.5	(64.0)	2091.0	
29	Shale (10 per cent exposed): recessive; minimum class clay, matrix more than 20 per cent, modal class clay; dark- to medium-brown, weathering yellowish brown; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; calcareous and silty; a few thin beds of argillaceous crinoidal wackestone or packstone (mass flow deposits?); basal contact gradational, continuous.	102.0	(334.7)	2071.5	
28	Shale (15 per cent exposed): moderately recessive; calcareous and silty; medium brown, weathering yellowish brown; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; this unit has been tectonically deformed and is somewhat contorted; basal contact gradational, continuous.	70.5	(231.3)	1969.5	
27	Shale (70 per cent exposed): resistant; silty and calcareous; minimum class clay, matrix more than 20 per cent, modal class clay, a little quartz silt; dark brown, weathering yellow; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; tentaculites and coiled cephalopods on bed surfaces; this unit forms the first resistant band near the base of the Funeral Formation; basal contact gradational, continuous.	21.0	(68.9)	1899.0	
26	Shale (5 per cent exposed): recessive; silty and calcareous; modal class clay, minimum class clay, maximum 5 per cent 0.2 mm; medium greyish brown, weathering light yellowish grey; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; basal contact abrupt.	96.0	(315.0)	1878.0	
	Total thickness of the Funeral Formation is 368.5 m (1209.0 ft).				
	Arnica Formation (*basinal member*)				
25	Dolostone (15 per cent exposed): moderately recessive and vegetated; a dolomitized skeletal and intraclast grainstone; medium- to dark-grey, weathering medium to dark grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; scattered exposures of conglomeratic graded debris flows of dolomitized skeletal				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	fragments (mainly crinoids) and reworked carbonate mud clasts oriented parallel to bedding; probably some intervals of dark grey dolomicrite laminite also occur in this unit; some selective silicification and chert nodules and small-scale solution-collapse breccia.	177.0	(580.7)	1782.0	(5846.5)
24	Dolostone (60 per cent exposed): moderately resistant; dolomitized, crinoid, wackestone debris flows; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; successive graded flows with coarse sand to pebble-sized lime mud and crinoid fragments; finer parts of debris flows are silicified; basal contact gradational, continuous.	67.0	(219.8)	1605.0	
23	Dolostone (25 per cent exposed): moderately resistant but vegetated; dolomitized fine grained wackestone; dark grey, weathering dark- to medium-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded, dark grey finely detrital beds grade upwards to medium grey, dolomitized calcisiltite (these may be fine grained mass flow deposits); some silicification along bedding; basal contact gradational, continuous.	90.0	(295.3)	1538.0	
	Total thickness of the basinal member of the Arnica Formation is 334.0 m (1095.8 ft).				
	Cadillac Formation				
22	Siltstone (70 per cent exposed): recessive; calcareous; dark brown and grey, weathering greyish pink; mainly detrital dolomite silt with limonite coated grains, quartz a minor constituent; minimum class clay, modal class silt, maximum 5 per cent 0.10 mm; bedding planar to lenticular, thin bedded, small-scale crossbedding forms lenticularly bedded intervals; basal contact abrupt.	36.0	(118.1)	1448.0	(4750.7)
21	Dolostone and siltstone (90 per cent exposed, 85 per cent dolostone, 15 per cent siltstone).				
	Dolostone: resistant; finely crystalline; dark grey, weathering dark- to medium-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; a dolomitized calcilutite or calcisiltite; vague laminations and some graded couplets suggest that these may be mass flow deposits, strongly silicified.				
	Siltstone: recessive; dolomitic; dark brown, weathering reddish pink (mixture of limonite and hematite in matrix); quartz only a minor constitutent, detrital dolomite silt forms 80–90 per cent of the rock; minimum class clay, modal class silt, maximum 5 per cent 0.01 mm; bedding planar, mode laminated, minimum laminated, maximum laminated; several metre thick intervals of siltstone are scattered throughout this unit.				
	Basal contact abrupt.	117.0	(383.9)	1412.0	
20	Siltstone (95 per cent exposed): slightly resistant; dolomite cemented; medium- to dark-brown, weathering yellow and pink; modal class silt, minimum class clay, maximum 5 per cent 0.1 mm; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; impure quartzarenite and detrital dolomicrite fragments, limonite disseminated throughout matrix; a few thick, resistant beds of fine sand that have erosional lower contacts are scattered within the unit; thicker siltstone beds are finely colour laminated and contain pyrite nodules, a few small, lenticular, somewhat silicified, coralline carbonate bodies scattered throughout (bioherms?); basal contact abrupt.	88.5	(290.4)	1295.0	
19	Limestone (80 per cent exposed): moderately resistant; skeletal intraclast packstone and wackestone; medium- to dark-grey, weathering medium grey to yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; graded beds of fragmental brachiopods, crinoids, corals (Coenites?) and lime mudclasts, grade upwards to light grey calcisiltite; clasts oriented parallel to bedding; some yellowish orange, argillaceous silt between beds; some black chert nodules near the top of the unit; basal contact abrupt.	10.5	(34.4)	1206.5	
18	Siltstone (20 per cent exposed): recessive; dolomite cemented and platy; medium brown, weathering light yellowish brown; quartz silt less than 90 per cent, a few microcline grains but mostly detrital dolomite grains rimmed with limonite; minimum class clay, modal class silt, maximum 5 per cent 0.50 mm; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; some white sandstone beds with eroded bases and load casts (turbidites?), these beds are commonly graded from medium- to fine-quartzarenite sand, a few rippled sand lenses in the siltstone; basal contact gradational, continuous.	39.0	(128.0)	1196.0	
17	Shale (40 per cent exposed): recessive, silty and fissile; medium brown to brownish grey, weathering light brownish orange; some distinct grains of limonite and some disseminated limonite in matrix; quartz less than 90 per cent; minimum class clay, modal class silt, maximum 5 per cent 0.05 mm; bedding planar, mode laminated, minimum thinly laminated, maximum very thin bedded; thicker siltstone beds contain disarticulated detrital brachiopods shells; basal contact gradational, continuous.	30.0	(98.4)	1157.0	
16	Sandstone and limestone (60 per cent exposed, 80 per cent sandstone, 20 per cent limestone).				
	Sandstone: moderately resistant; medium greyish brown, weathering yellowish brown; quartz more than 90 per cent; more feldspar than lithic clasts; bedding planar to weakly lenticular; minimum class silt, modal class fine sand, maximum 5 per cent 0.20 mm; mode laminated, minimum thinly laminated, maximum very thin bedded; many beds of siltstone rather than fine sandstone; some brachiopods on siltstone bed surfaces.				
	Limestone: moderately resistant; calcisiltite; medium- to dark-grey, weathering yellowish brown to grey; bedding wavy, mode very thin bedded, minimum laminated, maximum very thin bedded; some admixture of yellow-weathering, argillaceous material between grains; abundant atrypid-like brachiopods; some graded beds may be mass flow deposits; basal contact gradational, continuous.	12.0	(39.0)	1127.0	
15	Siltstone and limestone (75 per cent exposed, 90 per cent siltstone, 10 per cent limestone).				
	Siltstone: moderately resistant and dolomitic; medium- to light brown, weathering light orangish yellow; sorting fair, rounding and sphericity poor; minimum class clay, modal class silt; quartz less than 90 per cent; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy to flaggy parting.				
	Limestone: resistant; skeletal wackestone; dark grey, weathering medium grey; bedding planar, mode				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	thin bedded, minimum thin bedded, maximum medium bedded; beds of skeletal debris (crinoids, brachiopods and coral fragments) grade upwards to weakly laminated calcilutite or calcisiltite; these beds occur as individual interbeds within the siltstone.				
	Basal contact gradational, continuous.	105.0	(344.0)	1115.0	
14	Siltstone and limestone (70 per cent exposed, 80 per cent siltstone, 20 per cent limestone).				
	Siltstone: moderately resistant; dolomitic with micropellets of dolomite (0.04 mm) abundant; medium brown, weathering light orangish yellow; sorting fair, rounding and sphericity poor; quartz less than 90 per cent; minimum class clay, modal class silt, maximum 5 per cent 0.14 mm; bedding planar, mode thin bedded, minimum very thin bedded; maximum thin bedded, platy to flaggy parting.				
	Limestone: resistant; skeletal wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; beds of coral, crinoid and brachiopod fragments grade upwards to faintly laminated calcisiltite or calcilutite; orange weathering, argillaceous material occurs between the grains; unit occurs over a prominent rise and then along a bench.				
	Basal contact gradational, continuous.	150.0	(492.0)	1011.0	
13	Siltstone (80 per cent exposed): moderately resistant; dolomitic; light grey and greyish brown, weathering orange to yellowish orange; sorting fair, rounding and sphericity poor, quartz less than 90 per cent; minimum class clay, modal class silt, maximum 5 per cent 0.14 mm; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy partings; unit occurs along a prominent topographic bench; basal contact gradational, continuous.	90.0	(295.0)	861.0	
12	Limestone: resistant; calcilutite; medium grey, weathering greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; argillaceous and platy; some monograptid-like graptolites on bed surfaces; basal contact gradational, continuous.	20.0	(66.0)	771.0	
11	Siltstone and limestone (70 per cent siltstone, 30 per cent limestone).				
	Siltstone: resistant; dolomitic, with some silty dolostone; yellowish brown to orange, weathering yellowish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy parting with some ripple marks.				
	Limestone: resistant; skeletal wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; some graded beds with skeletal debris grading upwards from abundant brachiopod and crinoid fragments to vaguely laminated calcilutite; yellow argillaceous material occurs in the matrix between clasts.				
	Basal contact abrupt.	15.0	(49.0)	751.0	
10	Siltstone and limestone (80 per cent exposed, 65 per cent siltstone, 35 per cent limestone).				
	Siltstone: moderately resistant; dolomitic, with abundant micropellets of dolomicrite (pellets ~0.04 mm); brown to orange, weathering yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy parting.				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Limestone: resistant; skeletal wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; corals and crinoid graded debris flows occur in bunches throughout the unit; unit is exposed up a prominent rise.				
	Basal contact gradational, continuous.	155.0	(508.0)	736.0	
9	Siltstone (70 per cent exposed): moderately recessive; dolomitic, some silty dolomicrite with micropellets of dolomicrite (0.04 mm); light grey, weathering orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; thicker beds tend to be fine sandstone; platy to flaggy partings; unit is exposed along a topographic bench; basal contact abrupt.	90.0	(295.0)	581.0	
8	Limestone: resistant; argillaceous calcilutite; medium yellowish grey, weathering medium- to light-greyish yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; slightly silty; some monograptid-like graptolites; unit is exposed along a cliff; basal contact gradational, continuous.	20.0	(66.0)	491.0	
7	Dolostone and limestone (70 per cent dolostone, 30 per cent limestone).				
	Dolostone: resistant; silty; yellowish brown, weathering medium reddish orange; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; many beds are dolomitic siltstone, platy parting.				
	Limestone: resistant; calcilutite; medium- to dark-grey, weathering medium grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; some calcilutite beds contain brachiopod and crinoid fragments and an admixture of silty, yellow, argillaceous material; unit is exposed up a steep rise.				
	Basal contact abrupt.	15.0	(49.2)	471.0	
	Total thickness of the Cadillac Formation is 993.0 m (3257.9 ft).				
	Road River Formation				
6	Limestone (50 per cent exposed): recessive; argillaceous; dark grey to light yellowish grey, weathering light greyish yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy parting; some calcareous shale; unit exposed across a flat bench in the hill; basal contact abrupt. GSC loc. C-057845 (see Appendix 2).	51.0	(167.3)	456.0	(1496.1)
5	Dolostone (80 per cent exposed): resistant; dolomitized crinoidal wackestone; dark grey, weathering dark- to medium-grey; bedding planar to wavy, mode thin bedded, minimum very thin bedded, maximum medium bedded; thick but discontinuous, yellowish grey, flaggy partings; a little limonitized pyrite and somewhat calcareous; abundant, fine, skeletal debris; unit is exposed near brown of hill; basal contact abrupt.	24.0	(78.7)	405.0	
4	Dolostone (70 per cent exposed): moderately resistant; dolostone silty and calcareous; medium brownish grey, weathering medium to light yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy parting; unit is exposed along a steep rise; basal contact abrupt.	93.0	(305.1)	381.0	
	Total thickness of the Road River Formation is 168.0 m (551.2 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Whittaker Formation				
3	Dolostone: resistant; cherty; dark grey, weathering dark grey; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; dolomite and black chert appear interbedded as couplets laterally continuous over 0.5 m, the chert may be an early replacement of fine grained dolomite; basal contact gradational, continuous.	18.0	(59.1)	288.0	(944.9)
2	Dolostone (10 per cent exposed): a vegetated slope; slightly recessive; argillaceous; medium- to dark-grey, weathering yellowish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy and silty; this unit is very poorly exposed, the sandy beds in the Whittaker should be within this unit; basal contact gradational, continuous.	225.0	(738.2)	270.0	
1	Dolostone (75 per cent exposed): slightly recessive; argillaceous; medium- to dark-grey, weathering yellowish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; platy and silty; basal contact not exposed.	45.0	(147.6)	45.0	
	Incomplete thickness of the Whittaker Formation is 288.0 m (944.9 ft).				
	Total thickness of the Prairie Creek 4 Section is 2502.0 m (8208.7 ft).				

PRAIRIE CREEK 7 SECTION

SECTION 12. This is a west-dipping section on the west side of Prairie Creek, about 15 km north of Second Canyon on the South Nahanni River. It begins at Lat. 61°32'N; Long. 124°47'W (or 6823800N; 404350E in UTM coordinates) in the Virginia Falls map area (95F), in the District of Mackenzie, N.W.T. This section is best seen in RCAF air photo A17428-021 and regarded as part of Section 10.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Road River Formation				
8	Shale (70 per cent exposed): moderately recessive; calcareous; light grey, weathering very light grey; bedding planar and smooth, mode very thin bedded, minimum laminated, maximum very thin bedded; silty and platy; some thicker bedded intervals are really argillaceous calcilutites with shaly partings i.e. a rhythmite laminite. The Cadillac Formation overlies this unit; basal contact gradational, continuous.	22.5	(73.8)	296.0	(971.1)
7	Limestone (80 per cent exposed): slightly recessive; shaly; light grey, weathering light grey; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum medium bedded; shaly platy to flaggy partings; some pyritized graptolites; basal contact gradational, continuous. GSC loc. C-059233 (see Appendix 2).	90.0	(295.0)	273.5	
6	Dolostone (40 per cent exposed): yellowish grey argillaceous, platy; similar to the underlying unit but slightly thicker bedded; this unit is not well exposed.	30.0	(98.0)	183.5	
5	Dolostone (80 per cent exposed): slightly recessive; argillaceous and calcareous, finely crystalline; medium- to dark-grey, weathering yellowish grey; bedding planar and smooth, mode thin bedded, minimum very thin bedded, maximum thin bedded, argillaceous partings, bedding slightly wavy in places; basal contact gradational, continuous.	27.0	(89.0)	153.5	
	Total thickness of the Road River Formation is 169.5 m (556.1 ft).				
	Whittaker Formation				
4	Siltstone (40 per cent exposed): recessive; dolomitic; dark grey, weathering dark- to medium-grey; bedding planar to lenticular, mode very thin bedded, minimum laminated, maximum thin bedded; some intervals of silty shale, siltstone and shale are commonly interlaminated in couplets; load casted flute casts are common; flute casts indicate southwestward sediment transport; basal contact abrupt.	48.0	(157.5)	126.5	(415.0)
3	Dolostone (90 per cent exposed): resistant; argillaceous, finely crystalline; dark grey, weathering medium grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded, platy with argillaceous partings; basal contact abrupt.	37.5	(123.0)	78.5	
2	Siltstone (90 per cent exposed): resistant; argillaceous and dolomitic; dark grey to black, weathering dark grey to black; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; black chert and dolomitic black shale interlaminated with siltstone; some concretionary flute casts and convolute bedding.	21.0	(68.9)	41.0	
1	Dolostone (30 per cent exposed): recessive; argillaceous; dark grey, weathering dark grey and greenish grey; bedding wavy, mode thin bedded, minimum very thin bedded, maximum medium bedded; scattered crinoids; bedding thinner towards the top of the unit.	20.0	(65.6)	20.0	
	Incomplete thickness of the Whittaker Formation is 126.5 m (415.0 ft).				
	Total thickness of the Prairie Creek 5 Section is 296.0 m (971.1 ft).				

WEST HEADLESS SECTION

SECTION 13. This is a west-dipping section that begins at Lat. 61°28'N; Long. 124°50'W (or 6816400N, 402300E in UTM coordinates), about 16 km north of Second Canyon of the South Nahanni River in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. This section is best seen in RCAF air photo A17440-99.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Funeral Formation				
12	Shale: recessive; modal class clay; minimum class clay, maximum 5 per cent 0.02 mm; brown, weathering brownish yellow; bedding planar, mode laminated, minimum laminated, maximum laminated; fissile to thin platy partings; basal contact abrupt.	6.0	(19.7)	240.0	(787.4)
	Incomplete thickness of the Funeral Formation is 6.0 m (19.7 ft).				
	Arnica Formation (*basinal member*)				
11	Limestone and dolostone (40 per cent exposed, 85 per cent limestone, 15 per cent dolostone).				
	Limestone: moderately resistant; calcilutite and wackestone; dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; most of this limestone is silicified, some crosslaminations are present which may indicate that some of this limestone may be a calcarenite; these beds are weakly graded; some coarsely fragmental, fossiliferous (crinoids, corals) and intraclast-bearing wackestone mass flow deposits are also present.				
	Dolostone: silty; recessive; finely crystalline; brownish red to yellowish brown, weathering pink to brownish yellow; bedding planar, mode laminated, minimum laminated, maximum very thin				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	bedded; slightly argillaceous and platy; occurs as thin intervals interbedded with silicified limestone.				
	Basal contact gradational, continuous.	33.0	(108.3)	234.0	
10	Limestone A and limestone B: (50 per cent exposed, 80 per cent limestone A, 20 per cent limestone B).				
	Limestone A: moderately resistant; fossiliferous wackestone; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; graded beds of crinoid and intraclast (rounded lime mud fragments) wackestone that are irregularly silicified; some conglomeratic beds with rounded calcilutite fragments up to 20 cm long; fragments oriented parallel to bedding.				
	Limestone B: moderately resistant; calcirudite; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; conglomeratic, almost a breccia with many coarse, calcilutite fragments in a recrystallized matrix of packstone with abundant skeletal debris, including crinoids and brachiopod fragments; some silicification.				
	Basal contact gradational, continuous.	13.5	(44.3)	201.0	
9	Limestone (50 per cent exposed): slightly recessive; wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; calcarenite beds that grade upward to calcilutite causes medium and light grey beds to pass upwards to dark grey; some patchy areas of silicification; basal contact gradational, continuous.	15.0	(49.2)	187.5	
8	Dolostone (40 per cent exposed): slightly resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; appears to be a partly silicified and dolomitized calcarenite; some silicified wackestone; silicification appears to outline some small-scale crossbedding; basal contact abrupt. GSC loc. 052993 (see Appendix 2).	13.5	(44.3)	172.5	
7	Dolostone (40 per cent exposed): slightly resistant; finely crystalline; dark grey to brownish grey, weathering medium grey and brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; laminated dolomitized wackestone or calcilutite with thin, lenticular, black chert bands; this unit and the overlying units of the dark siliceous member of the Arnica Formation are poorly exposed on a dip slope leading down to the Funeral contact; basal contact abrupt.	9.0	(29.5)	159.0	
6	Dolostone: resistant; finely crystalline; dark- to light-greyish brown, weathering dark to light greyish brown; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; dolomite laminite with some scattered ostracodes (laminites may be calcilutite turbidite deposits); several laminite beds have detached to form disharmonic slump folds that are cored with breccia cemented by white dolomite; black chert masses are also brecciated; basal contact abrupt.	9.0	(29.5)	150.0	
	Total thickness of the basinal member of the Arnica Formation is 93.0 m (305.1 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Cadillac Formation				
5	Siltstone and dolostone (40 per cent exposed, 75 per cent siltstone, 25 per cent dolostone).				
	Siltstone: recessive; dolomitic and shaly; modal class silt, minimum class silt, maximum 5 per cent 0.07 mm; dark brown to pinkish brown, weathering medium brownish red; sorting good, rounding and sphericity good; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy, almost fissile; very sapropelic.				
	Dolostone: moderately resistant; finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; dolomitized skeletal and intraclast grainstones, packstones and wackestones; wackestone intraclasts up to 10 cm long and abundant crinoid and coral fragments; individual debris flows are lighter grey and have relatively smooth bases and irregular tops; fragments tend to be oriented parallel to bedding; surrounding dark grey, dolomitized calcilutite beds are drastically deformed; this lithology occurs as intervals, several metres thick, containing many flows interbedded with pink siltstone. GSC locs. C-052984, C-052985 (see Appendix 2).	48.0	(157.5)	141.0	(462.6)
4	Siltstone (90 per cent exposed): moderately recessive; dolomitic; minimum class clay, modal class silt, maximum 5 per cent 0.06 mm; medium reddish brown, weathering light- to medium-reddish brown; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; slightly argillaceous or shaly, platy; in thin section dolomite-quartz silt-limonite coated grains are in the proportion 70%-20%-10%, much of this dolomite might be detrital; basal contact abrupt.	33.0	(108.3)	93.0	
3	Siltstone and dolostone, 5 per cent exposed, 90 per cent siltstone, 10 per cent dolostone).				
	Siltstone: recessive; dolomite cemented; modal class silt, minimum class silt, maximum 5 per cent 0.07 mm; medium brownish red and brown, weathering yellowish brown and yellowish red; sorting good; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; slightly sooty and shaly.				
	Dolostone: recessive; finely crystalline; medium- to dark-grey, weathering medium- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; a dolomitized grainstone or packstone; some colour banding due to graded bedding in these mass flow deposits; crinoids abundant; some chert as selective replacement of fossiliferous patches.				
	Basal contact gradational, continuous.	33.0	(108.3)	60.0	
2	Siltstone (10 per cent exposed): recessive; dolomite cemented; modal class silt, minimum class clay, maximum 5 per cent 0.07 mm; medium brownish red, weathering medium brownish red; sorting good; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; slightly argillaceous, flaggy; thicker beds tend to be fine sandstone; limonite grain coatings impart a red colouration; unit exposed in a valley; overlying units are exposed up a slope; basal contact gradational, continuous.	16.5	(54.1)	27.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
1	Siltstone and dolostone (90 per cent siltstone, 10 per cent dolostone). Siltstone: moderately resistant; dolomite cemented; medium- to light-brown with a pink tint, weathering medium- to light-brown with a pink tint; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and argillaceous; some oscillatory, straight crested ripples on some thicker beds; thicker beds tend to be fine sandstone. Dolostone: moderately resistant; finely crystalline; dark brownish grey, weathering dark brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; a dolomitized calcilutite with some dark grey chert masses; solitary beds or groups of beds of this dolomite are scattered throughout. Basal contact gradational, continuous.	10.5	(34.5)	10.5	
	Incomplete thickness of the Cadillac Formation is 141.0 m (462.6 ft).				
	Total thickness of the West Headless Section is 240.0 m (787.4 ft).				

SECOND CANYON 3 SECTION

SECTION 14. This is a gently northeast-dipping section on the north side of the South Nahanni River near Third Canyon. It begins at Lat. 61°22'N; Long. 124°51'W in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. Thicknesses are estimated.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Sombre Formation (*detrital member*)				
1	Dolostone: resistant; finely crystalline; light grey to black, weathering light grey to black; the lower part of the unit is dominated by dark grey, argillaceous, thin bedded dolomite with scattered, light grey thin beds of dolomitized, weakly graded, crinoidal wackestone and packstone with some platy intraclasts; some of these debris flow beds are limestone at the base of the unit; thin, crinoid, hash beds commonly have thin, dark grey shaly partings and intertongue eastward into thick bedded featureless light grey Sombre dolomite. The upper part of the unit also contains thick debris flow beds that have planar lower contacts but very undulose upper contacts; in a 1.5 m thick bed, the undulose upper contact causes a pinch and swell of about 1 m in amplitude to develop; these thicker debris flow beds contain abundant, very coarse crinoids with ossicles more than 5 cm long; dark beds between light grey debris flows are argillaceous dolomite rather than shale.	250.0	(820.2)	250.0	(820.2)
	Incomplete thickness of the Sombre Formation is 250.0 m (820.2 ft).				

WEST TUNDRA 1 SECTION

SECTION 15. This is an east-dipping section that extends eastward across a ridge between Prairie Creek and Tundra Ridge in the northern part of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It begins at Lat. 61°43'N; Long. 124°50'W (or 6843750N, 403200E in U.T.M. coordinates) and is best seen in RCAF air photo A17441-087.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
11	Limestone: resistant; fossiliferous wackestone; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; corals and stromatoporoids abundant and partly silicified about 100 m above this unit to the top of the Nahanni; basal contact gradational, continuous.	135.0	(442.9)	1063.0	(3487.5)
10	Limestone: resistant; fossiliferous wackestone; medium grey, weathering medium grey; bedding planar and uniformly very thick; abundant, partly silicified, lamellar stromatoporoids and corals; basal contact gradational, continuous.	90.0	(295.3)	928.0	
9	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; many beds contain abundant amphiporids and corals; darker grey beds contain large amounts of bitumen; basal contact gradational, continuous.	24.0	(78.7)	838.0	
8	Talus (5 per cent exposed): this unit is a talus slope at the foot of the overlying cliff-forming units of Nahanni; blocks of fossiliferous wackestone.	57.0	(187.0)	814.0	
	Incomplete thickness of the Nahanni Formation 306.0 m (1003.9 ft).				
	Headless Formation				
7	Limestone (30 per cent exposed): recessive; argillaceous wackestone; grey mottled yellowish green, weathering medium greenish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; scattered brachiopods and trilobites; this and the overlying units dip into a steep slope; basal contact abrupt. GSC loc. C-057791 (see Appendix 2).	207.5	(680.8)	757.0	(2483.6)
	Total thickness of the Headless Formation is 207.5 m (680.8 ft).				
	Funeral Formation				
6	Shale and siltstone (10 per cent exposed, 50 per cent shale, 50 per cent siltstone). Shale: recessive; medium brownish grey, weathering light brownish yellow and greenish yellow; bedding planar and laminated; fissile, light coloured millimetre-thick laminations caused by silt. Siltstone: moderately recessive; medium- to light-brownish grey, weathering light brownish yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; argillaceous and platy; unit occupies a dip slope leading down to a stream bottom. Basal contact abrupt.	150.0	(492.1)	549.5	(1802.8)
	Total (estimated) thickness of the Funeral Formation is 150.0 m (492.1 ft).				
	Arnica Formation				
5	Dolostone (10 per cent exposed): resistant; finely crystalline; dark brown to greyish brown, weathering dark greyish brown; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; some bands of laminated black chert; scattered crinoids in coarsely laminated dolomite; this unit is a dip slope covered by vegetation from the top of the ridge crest down to the Funeral contact; basal contact gradational, continuous.	75.0	(246.1)	399.5	(1310.7)
4	Dolostone (20 per cent exposed): slightly recessive; finely crystalline; dark brownish grey with light grey bands, weathering dark to medium brownish grey with white bands; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; intervals of light grey to white, dolomitized, crinoid packstones in thin beds separated by thin, dark grey laminae form white bands in dark brown, laminated dolomite; soft sediment deformation structures throughout; much of this dolomite is silicified with many resistant chert bands; basal contact gradational, continuous.	78.0	(255.9)	324.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
3	Dolostone (10 per cent exposed): slightly recessive?; finely crystalline; similar to the overlying unit but less well exposed; some large (200 m long), tabular, grey mudclasts in some of the thicker, medium bedded, debris flows; abundant soft sediment deformation structures that in some places formed penecontemporaneous breccias; a little later brecciation in lithified sediments infilled with white dolomite; basal contact gradational, continuous.	69.0	(213.3)	246.5	
2	Dolostone (10 per cent exposed): slightly recessive?; finely crystalline; dark brown dolomite laminite similar to overlying unit; one thick bed of chaotic lithoclast breccia of tabular clasts overlying beds with tension fractures and sheet cracks infilled with geopetal carbonate silt and white dolomite cement; this and the overlying units are heavily growth covered, but there is no evidence to suggest the presence of shales or siltstones in these Arnica units; basal contact abrupt.	87.0	(285.4)	181.5	
	Total thickness of the Arnica Formation (basinal member) is 305.0 m (1000.7 ft).				
	Cadillac Formation				
1	Siltstone (10 per cent exposed): recessive; dolomitic; modal class silt, minimum class clay; yellowish grey to greyish pink, weathering yellow and pink; bedding planar, mode very thin bedded, minimum laminated, maximum medium bedded; fine coarser silt and fine sand laminae weather lighter in colour and are faintly erosional; basal contact gradational.	94.5	(310.0)	94.5	(310.0)
	Incomplete thickness of the Cadillac Formation is 94.5 m (310.0 ft).				
	Total thickness of the West Tundra 1 Section is 1063.0 m (3487.5 ft).				

NORTH TUNDRA SECTION

SECTION 16. This is an east-dipping section that begins at Lat. 61°58'N; Long. 124°56'W (or 6872250N, 398650 E in UTM coordinates). It extends eastward across the north end of Tundra Ridge in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It is best shown in RCAF air photo A17428-198.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Sombre Formation				
13	Dolostone A and dolostone B (85 per cent dolostone A, 15 per cent dolostone B). Dolostone A: resistant; finely crystalline; dark- to medium-grey, weathering dark- to light-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; dark grey beds grade upwards to lighter grey, faintly laminated beds. Dolostone B: recessive; finely crystalline, medium yellow to yellowish grey, weathering light yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; silty and laminated, intervals of dolostone B cap cycles of dolostone A. Basal contact gradational, continuous.	84.0	(275.6)	997.6	(3273.0)
12	Dolostone: resistant; finely crystalline; dark- to medium-grey, weathering dark- to medium-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; mainly dark, almost black and slightly petroliferous, abundant biogenic vugs; basal contact abrupt.	58.5	(191.9)	913.6	
	Incomplete thickness of the Sombre Formation is 247.5 m (812.0 ft).				
	Camsell Formation (*Corridor Member*)				
11	Dolostone and sandstone (90 per cent exposed, 90 per cent dolostone, 10 per cent sandstone). Dolostone: slightly resistant; calcareous; colour light- to dark-grey, weathering dark grey to light grey and yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; light coloured dolomite laminites; dark beds are calcareous dolomite and not laminated. Sandstone: slightly resistant; minimum class silt, modal class fine sand, maximum 5 per cent 0.5 mm; medium brownish orange, weathering light brownish orange; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; many beds finely laminated, almost platy; several thin sandstone intervals in this unit. Basal contact gradational, continuous.	105.0	(344.5)	855.1	(2805.5)
10	Dolostone and limestone (70 per cent dolostone, 30 per cent limestone). Dolostone: slightly resistant; finely crystalline; medium yellow, weathering medium yellow to yellowish orange; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; commonly laminated with silty and sandy seams; silt and sand in streaks throughout. Limestone: slightly resistant; dolomitic calcilutite; dark grey, weathering dark- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; some faintly laminated darker grey limestone tends to be vuggy and bioturbated; limestone beds tend to grade upwards to silty dolomite. Basal contact gradational, continuous.	8.2	(26.9)	750.1	
9	Dolostone, sandstone and limestone (60 per cent dolostone and sandstone, 40 per cent limestone). Dolostone and sandstone: slightly resistant; finely crystalline; medium yellow to orange, weathering light yellow to medium orange; bedding planar, mode medium bedded, minimum very thin bedded, with contorted fine laminations, maximum medium bedded; silty and sandy dolomite and orange dolomitic sandstone, platy in parts; sandstone almost as abundant as dolomite. Limestone: moderately resistant; pelletal wackestone with ostracodes and fenestral fabric; dark grey, weathering dark grey to medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; dark grey limestones are petroliferous; limestones are interbedded with dolomite and sandstone and tend to grade upwards to light yellow dolomite laminite; lithologies interbedded on a scale of 1-10 m. Basal contact gradational, continuous.	61.6	(202.1)	741.9	
8	Dolostone, sandstone and limestone (40 per cent dolostone, 30 per cent sandstone, and 30 per cent limestone). Dolostone: moderately resistant; finely crystalline; medium- to light-yellow, weathering light yellow to light yellowish orange; bedding planar, mode medium bedded, minimum very thin bedded, maximum medium bedded; silty and laminated, some mudcracks and possible stromatolite undulations. Sandstone: slightly recessive; medium brownish orange, weathering brownish orange to orange; bedding				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	planar to lenticular, mode thin bedded, minimum laminated, maximum thin bedded; a dolomite-cemented, impure quartzarenite; blocky sandstone beds are greyer and tend to grade upwards to platy orange beds.				
	Limestone: moderately resistant; dolomitic calcilutite; medium- to dark-grey, weathering medium- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; darker grey beds are slightly vuggy and petroliferous and are commonly bioturbated; the lithologies of this unit are interbedded in intervals that average about 3.0 m thick.				
	Basal contact gradational, continuous.	176.6	(579.4)	680.3	
7	Limestone, dolostone and sandstone (50 per cent limestone, 40 per cent dolostone and 10 per cent sandstone).				
	Limestone: moderately resistant; dolomitic calcilutite; dark- to medium-grey; mode medium bedded, minimum thin bedded, maximum thick bedded; darker grey beds are mottled and bioturbated.				
	Dolostone: moderately resistant; finely crystalline, calcareous; light yellow, weathering light yellow to light yellowish orange; mode thin bedded, minimum very thin bedded, maximum thick bedded; a thin submillimetre, almost microscopic lamination to millimetre thick laminations.				
	Sandstone: slightly recessive; dolomitic, calcareous; medium yellowish brown, greyish orange and orangish brown, weathering medium brownish orange to orange; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; a dolomite-cemented, impure quartz-arenite; thicker beds are more dolomitic, greyer and contain biogenic vugs; blocky sandstone beds tend to grade upwards to platy beds and rest sharply on underlying beds, they occasionally contain chips of the underlying bed.				
	Basal contact gradational, continuous.	102.3	(335.6)	503.7	
6	Limestone, dolostone and sandstone (70 per cent limestone, 25 per cent dolostone, 5 per cent sandstone).				
	Limestone: moderately resistant; calcilutite; dark- to medium-grey, weathering dark- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; slightly bioturbated with a few scattered ostracodes; dark grey beds tend to grade upwards to medium grey beds and light grey dolomite laminite with some fenestral fabric.				
	Dolostone: moderately resistant, finely crystalline; pelletal and calcareous with ostracodes, contorted; light grey to yellow, weathering light grey to medium yellow; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; a few thick beds of light grey laminite but mainly yellow, silty, thin bedded laminite.				
	Sandstone: slightly recessive; brownish orange to greyish orange, weathering orange to greyish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thick bedded; dolomite-cemented, impure quartzarenite; greyish orange, thick beds tend to grade upwards to thin beds.	113.4	(372.0)	401.4	
	Total thickness of the Corridor Member of the Camsell Formation is 567.1 m (1860.6 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Vera Formation				
5	Limestone: recessive; slightly argillaceous calcilutite; medium grey, weathering medium grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; platy; homogeneous limestone; basal contact abrupt.	27.0	(88.6)	288.0	(944.9)
4	Limestone: slightly recessive; medium- to dark-grey, weathering medium- to dark-grey with some pink mottlings on bed surface; bedding planar but uneven, uniformly very thin bedded; sparsely fossiliferous with abraided crinoids and brachiopods; basal contact gradational, continuous.	73.5	(241.1)	261.0	
3	Limestone: slightly recessive; medium- to dark-olive-grey, weathering medium- to dark-olive-grey; bedding wavy, uniformly very thin bedded; fairly abundant, yellow, irregular and discontinuous argillaceous seams; in the lower part of the unit the seams are abundant enough to impart a distinctly striped appearance; basal contact abrupt. GSC loc. C-057824 (see Appendix 2).	87.0	(285.4)	189.5	
2	Limestone: slightly resistant; calcilutite; medium brownish grey, weathering medium- to light-brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; distinctly pelletal and slightly fossiliferous with crinoid and brachiopod fragments; some yellow, irregular and discontinuous, argillaceous seams; basal contact abrupt.	69.0	(226.4)	100.5	
1	Limestone and dolostone (90 per cent limestone, 10 per cent dolostone).				
	Limestone: slightly resistant; medium olive-grey; bedding wavy and uneven, mode thin bedded, minimum very thin bedded, maximum thin bedded; fossiliferous and argillaceous wackestone with fine skeletal debris of crinoids and brachiopods; argillaceous material in thin, discontinuous yellow seams.				
	Dolostone: slightly recessive; light yellowish grey, weathering light yellow; bedding planar and smooth, mode laminated, minimum laminated, maximum very thin bedded; silty and platy; this dolostone occurs as several 1.0 m thick interbeds in the limestone of this unit; basal contact gradational, continuous.	31.5	(103.4)	31.5	
	Incomplete thickness of the Vera Formation is 288.0 m (944.9 ft).				
	Total thickness of the North Tundra Section is 997.6 m (3273.0 ft).				

TUNDRA RIDGE SECTION

SECTION 18. This is an east-dipping section that begins at Lat. 61°52'N; Long. 124°56'W (6859600N and 400000E in UTM coordinates). It extends eastward along a ridge line among the row of ridges that together comprise Tundra Ridge in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. This section is best shown in RCAF air photo A17428-127. This section includes the type section of the Sombre Formation (Douglas and Norris, 1961, p. 14) and also includes the type section of the Corridor Member of the Camsell Formation.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Sombre Formation				
75	Dolostone (90 per cent exposed): resistant; medium crystalline; light grey grading upwards to medium grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thicker bedded; some small medium- to dark-grey chert nodules oriented parallel to bedding; some solution-enlarged, slightly fractured, biogenic vugs (brachiopods?) floored with dark				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	grey, geopetal, carbonate silt and cemented with white, coarsely crystalline dolomite; basal contact gradational, continuous.	33.0	(108.3)	2161.5	(7091.5)
74	Dolostone: resistant; finely crystalline; brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; most beds in this interval are brecciated with white, coarsely crystalline dolomite as interfragment cement; some chert nodule bands in unbrecciated beds; basal contact gradational, continuous.	10.5	(34.5)	2128.5	
73	Dolostone (20 per cent exposed): slightly recessive; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; light grey beds of dolomite laminite alternate with thicker beds of dark, brownish-grey, vuggy (biogenic porosity) and fetid dolomite; some breccia, as in overlying bed, with some silicified clasts; basal contact gradational, continuous.	33.0	(108.3)	2118.0	
72	Dolostone (40 per cent exposed): resistant; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; dark brownish grey beds of vuggy, fetid dolomite grade upwards to light grey dolomite laminites; a little breccia cemented by white dolomite; basal contact gradational, continuous.	45.0	(147.6)	2085.0	
71	Dolostone (20 per cent exposed): slightly recessive; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; vuggy, brownish grey dolomite alternating with light grey dolomite laminite as in overlying interval, but proportion of dark dolomite is greater here; basal contact gradational, continuous.	24.0	(78.7)	2040.0	
70	Dolostone: resistant; finely to very finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; dark brownish grey dolomite and light grey laminite cycles, as in overlying unit; some dark beds contain stromatoporoids and crinoids; dark beds overlie light grey beds with erosional contacts; basal contact gradational, continuous.	30.0	(98.4)	2016.0	
69	Dolostone: resistant; finely to very finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium grey and brownish grey dolomite beds alternate with light grey laminites; dark beds contain abundant vugs and partly leached amphiporids and thamnoporids and other corals, some spaghetti rock with leached amphiporids; basal contact gradational, continuous.	57.0	(187.0)	1986.0	
68	Dolostone A and dolostone B (95 per cent dolostone A, 5 per cent dolostone B). Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium grey beds grade upwards to thinner beds of light grey dolomite. Dolostone B: recessive; finely crystalline; colour buff, weathering light yellowish grey; bedding planar to wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; a few beds of dolostone B occur near the top of the unit.				
	Basal contact gradational, continuous.	67.5	(221.5)	1929.0	
67	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium to dark grey, vuggy dolostone grades upward to light grey, weakly laminated dolomite; darker grey beds tend to abruptly overlie light grey beds with some notably erosional contacts; vugs in dark beds are leached and solution-enlarged biogenic porosity; basal contact gradational, continuous.	45.0	(147.6)	1861.5	
66	Dolostone: resistant; finely to very finely crystalline; light grey, weathering light grey; bedding planar; a nonbedded, chaotic, mudsupported, dolomite breccia with little colour contrast, between blocks and matrix; no sorting or grading of angular, light grey, dolomite blocks although there is a slight alignment parallel to bedding; blocks range from a few centimetres to a few metres long; some fragments have long, thin apophyses projecting into the carbonate mud matrix; basal contact abrupt.	33.0	(108.3)	1816.5	
65	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium and dark grey beds grade upwards to light grey dolomite in cycles as in some overlying units; basal contact gradational, continuous.	22.5	(73.8)	1783.5	
64	Dolostone A and dolostone B (80 per cent exposed, 95 per cent dolostone A, 5 per cent dolostone B). Dolostone A: resistant; finely crystalline; interbedded medium and light grey dolomite, as in overlying units; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded. Dolostone B: recessive; very finely crystalline; impurities, silt; colour buff, weathering light yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; occurs as scattered interbeds mainly within lighter grey dolomite.				
	Basal contact gradational, continuous.	76.5	(251.0)	1761.0	
63	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium and light grey dolomite as in overlying units, lighter grey intervals are relatively thin; basal contact gradational, continuous.	76.5	(251.0)	1684.5	
62	Dolostone: resistant; finely crystalline; bedding planar, mode thick bedded, minimum thin bedded, maximum thick bedded; interbedded medium and light grey dolostone; abundant vugs in dark dolostone; dark dolostone beds commonly sharply overlie light coloured dolostone; basal contact gradational, continuous.	34.5	(113.2)	1608.0	
61	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; light and medium grey dolomite interbedded; light grey dolomite laminite common with many contorted laminae (algal mat overfolds?); basal contact gradational, continuous.	37.5	(123.0)	1573.5	
60	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium and dark grey dolomite breccia; appears to be a solution-collapse breccia but original bedding is discernible; some chaotic breccia in pipes cemented with white dolomite; fragments tend to be rounded and are up to 0.5 m long; basal contact abrupt.	21.0	(68.9)	1536.0	
59	Dolostone (50 per cent exposed): slightly recessive; finely crystalline; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; medium grey, slightly vuggy dolostone grades upward to light grey dolostone; basal contact gradational, continuous.	27.0	(88.6)	1515.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
58	Dolostone (10 per cent exposed): recessive; finely crystalline; very dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; mainly a slope covered with vegetation but with a few outcrops of bituminous biolithite containing abundant colonial rugose corals and stromatoporoids; basal contact gradational, continuous.	36.0	(118.1)	1488.0	
57	Dolostone (25 per cent exposed): recessive; finely crystalline; very dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; coral- and stromatoporoid-bearing dolomite biolithite as in overlying unit; units 10 and 11 together comprise the middle dark band of the Sombre Formation described by Douglas and Norris (1961, p. 14); basal contact gradational, continuous.	6.0	(19.7)	1452.0	
56	Dolostone (25 per cent exposed): recessive; finely crystalline; dark grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; a dolomitized crinoidal wackestone with some leached biogenic porosity; basal contact gradational, continuous.	58.5	(191.9)	1446.0	
55	Dolostone (80 per cent exposed): resistant; finely crystalline; bedding planar, mode thin bedded; minimum very thin bedded, maximum medium bedded; medium grey beds grade upwards to light grey laminite; darker beds contain small vugs; basal contact gradational, continuous.	47.0	(154.2)	1387.5	
54	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; medium to light grey cycles as in overlying unit; some random interbeds of light grey dolomite in medium grey beds; basal contact gradational, continuous.	30.0	(98.4)	1340.5	
53	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded light and medium grey dolostone as in overlying units, medium grey dolostone is full of small, biogenic vugs; basal contact gradational, continuous.	33.0	(108.3)	1310.5	
52	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedding, minimum thin bedded, maximum thick bedded; interbedded medium and light grey dolomite as in overlying units; some thin, white dolomite beds are dolomitized, pisolitic grainstones containing good fenestral fabric; quartz silt abundant (>20%); basal contact gradational, continuous.	49.5	(162.4)	1277.5	
51	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium and light grey dolomite; some zones of thamnoporid-like corals and vugs in the thicker beds of darker dolomite; basal contact gradational, continuous.	30.0	(98.4)	1228.0	
50	Dolostone: resistant; finely crystalline; beding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium grey and light grey dolomite; some stromatolitic undulations in the light grey dolomite laminite; basal contact gradational, continuous.	30.0	(98.4)	1198.0	
49	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded medium and light grey dolomite; corals in some thicker, darker grey beds; basal contact gradational, continuous.	43.5	(142.7)	1168.0	
48	Dolostone (95 per cent exposed): resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded, featureless, medium grey dolomite and light grey dolomite laminite; basal contact abrupt.	64.5	(211.6)	1124.5	
	Total thickness of the Sombre Formation is 1101.5 m (3613.8 ft).				
	Camsell Formation (*Corridor Member*)				
47	Dolostone A and dolostone B (95 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, mininum thin bedded, maximum thick bedded; homogeneous, dark grey dolomite grades upward to light grey dolomite laminite; dark beds overlie light grey intervals with a sharp erosional contact.				
	Dolostone B: recessive; very finely crystalline; bedding planar to wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; this unit and most underlying ones have a pronounced striped appearance; interbeds of yellow weathering, buff dolomite with silty, argillaceous partings.				
	Basal contact absent.	97.5	(319.9)	1060.0	(3477.7)
46	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; more than 20 cycles where dark, weakly laminated dolomite grades upward to light grey dolomite laminite; some laminae have been penecontemporaneously reworked into chip breccias with a carbonate mud matrix.				
	Dolostone B: recessive; finely crystalline; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; yellowish orange weathering, silty, buff dolomite that forms thin interbeds within dolostone A.				
	Basal contact abrupt.	96.0	(315.0)	962.5	
45	Dolostone and limestone (95 per cent dolostone, 5 per cent limestone).				
	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; more than 20 cycles of dark grey dolomite grading upwards to thinner intervals of light grey dolomite laminite; some of light grey dolomite is yellowish grey.				
	Limestone: resistant; pelletal wackestone or packstone; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; a single 3 metre thick bed of weakly crossbedded limestone in this unit.				
	Basal contact abrupt.	73.5	(241.1)	866.5	
44	Dolostone: moderately resistant; finely crystalline; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; silty, greyish yellow-weathering dolomite with silt in fine laminae; basal contact gradational, continuous.	12.0	(39.4)	793.0	
43	Dolostone A, dolostone B and limestone (80 per cent dolostone A, 10 per cent dolostone B and 10 per cent limestone).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 11 cycles of dark grey dolomite grading upwards to light grey dolomite; dark dolomite is vuggy and slightly silicified.				
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; platy and silty.				
	Limestone: recessive; pelletal calcilutite; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; burrown-mottled and slightly dolomitic.				
	Basal contact abrupt.	78.0	(255.9)	781.0	
42	Dolostone A, dolostone B and limestone (75 per cent dolostone A, 10 per cent dolostone B, 15 per cent limestone).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 7 cycles of dark grey, vuggy dolomite grading upwards to light grey dolomite laminite; vague corals and/or stromatoporoids in dark dolomite are slightly silicified.				
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode thin bedded, minimum medium bedded, maximum laminated; silt in seam and parting planes in this platy dolomite; dolostone B caps the unit and tends to separate cycles of dolostone A.				
	Limestone: resistant; skeletal and pelletal packstone; medium- to light-grey, weathering light grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; partly dolomitized and silty, trough crossbedding is common with troughs up to 0.5 m across; abundant skeletal debris in the sub 2 mm size fraction; limestone occurs as 3 distinct beds in this unit.				
	Basal contact abrupt.	61.5	(201.8)	703.0	
41	Dolostone and limestone (75 per cent dolostone, 25 per cent limestone).				
	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; cycles of dark dolomite grading upwards to light dolomite as in overlying units.				
	Limestone: resistant; pelletal wackestone; medium grey, weathering light- to medium-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; this limestone is restricted entirely to a single, 3 m thick interval that is vaguely laminated.				
	Basal contact abrupt.	34.5	(113.2)	641.5	
40	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 6 cycles of dark and light grey dolomite as in overlying units.				
	Dolostone B: recessive; finely crystalline; yellow to buff, weathering yellowish grey to yellow orange; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; a very platy and silty dolomite as thin interbeds throughout the unit.				
	Basal contact abrupt.	42.0	(137.8)	607.0	
39	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 6 dark and light grey cycles as in overlying units; some dark, fetid beds are recognizably lenticular bioherms about 20-30 m broad and 1 m thick with abundant, slightly silicified stromatoporoids and corals; basal contact abrupt.	27.0	(88.6)	565.0	
38	Dolostone A and dolostone B (80 per cent exposed, 80 per cent dolostone A; 20 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 5 dark and light grey cycles as in overlying unit; dark dolomite is vuggy and biostromal; light dolomite is silty and calcareous with small vugs filled with an orange carbonate mineral.				
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar to lenticular, mode thin bedded, minimum laminated, maximum medium bedded; abundant laminae of fine sand and silt; some mudcracks on bed surface.				
	Basal contact abrupt.	28.5	(93.5)	538.0	
37	Dolostone A and dolostone B (80 per cent dolostone A, 20 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; cycles of dark- to light-grey dolomite as in overlying unit.				
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; abundant silt and fine sand laminae.				
	Basal contact abrupt.	12.0	(39.4)	509.5	
36	Dolostone: slightly recessive; finely crystalline; yellow, weathering greyish yellow to yellowish orange; bedding planar, mode thin bedded, minimum laminated, maximum thick bedded; finely laminated with thin silt laminae; basal contact abrupt.	10.0	(32.8)	497.5	
35	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; intimately interbedded light and dark grey dolostone; basal contact abrupt.	9.0	(29.5)	487.5	
34	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; cycles of dark grey dolostone grading upwards to light grey dolostone.				
	Dolostone B: recessive; finely crystalline; yellow, weathering yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; platy and silty.				
	Basal contact gradational, continuous.	42.0	(137.8)	478.5	
33	Limestone: resistant; pelletal grainstone and packstone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded maximum medium bedded; slightly dolomitized and weakly cross-bedded; basal contact abrupt.	2.0	(6.6)	436.5	
32	Dolostone: slightly recessive; finely crystalline; yellow, weathering yellow; bedding planar, mode thin				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	bedded, minimum laminated, maximum thin bedded; platy and silty, some polygonal mudcracks; basal contact abrupt.	9.0	(29.5)	434.5	
31	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; cycles of dark grey dolostone grading upwards to light grey dolostone, dark vuggy dolostone rests on light grey dolostone with a sharp, erosional contact; some quartz silt; basal contact abrupt.	6.0	(19.7)	425.5	
30	Dolostone: recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar to wavy, mode medium bedded, minimum laminated, maximum medium bedded, weakly crossbedded with fine silt laminations; disseminated limonite causes orange and yellow stain; basal contact abrupt.	15.0	(49.2)	419.5	
29	Dolostone A and dolostone B (70 per cent dolostone A, 30 per cent dolostone B).				
	Dolostone A: slightly recessive; finely crystalline; yellow, weathering yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; silty and finely laminated, some crinkled laminae may be algal in origin, some mudcracks.				
	Dolostone B: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; medium and light grey dolostone, light grey dolostone is laminated.				
	Basal contact abrupt.	18.0	(59.1)	404.5	
28	Dolostone: resistant; finely crystalline; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; light grey dolomite laminite and medium grey dolomite are interbedded; basal contact abrupt.	9.0	(29.5)	386.5	
27	Dolostone: recessive; finely crystalline; yellow, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; fine silt laminae are crinkled and may be partly algal in origin; basal contact gradational, continuous.	3.0	(9.8)	377.5	
26	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B).				
	Dolostone A: slightly recessive; finely crystalline; yellowish grey, weathering light yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; faintly laminated with quartz silt.				
	Dolostone B: resistant; finely to medium crystalline; dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; biostromal fetid dolomite containing abundant stromatoporoids (amphiporids) and corals, very vuggy.				
	Basal contact gradational, continuous.	17.5	(57.4)	374.5	
25	Dolostone A and dolostone B (70 per cent dolostone A, 30 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; cycles of dark grey dolostone grading upwards to light grey dolomite laminite; stromatolites (algal biscuits) and shell layers in dark dolomite and many small vugs strung out parallel to bedding; some silicification of fossils.				
	Dolostone B: recessive; finely crystalline; impurities, silt; yellow, weathering yellowish orange; bedding lenticular, mode laminated, minimum laminated, maximum very thin bedded; platy and silty with some isolated ripples.				
	Basal contact gradational, continuous.	33.0	(108.3)	357.0	
24	Dolostone and limestone (90 per cent dolostone, 10 per cent limestone).				
	Dolostone: resistant; finely crystalline; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; beds of dark grey, vuggy dolostone grading upwards to yellowish grey dolomite laminite.				
	Limestone: resistant; pelletal and intraclast grainstone; medium grey, weathering medium to light grey; bedding planar to slightly wavy, mode thin bedded, minimum thin bedded, maximum thin bedded; smooth beds perhaps weakly crossbedded.				
	Basal contact abrupt.	14.5	(47.6)	324.0	
23	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B).				
	Dolostone A: slightly recessive; finely crystalline; yellow, weathering yellowish grey to orange; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and silty, finely laminated dolostone.				
	Dolostone B: resistant; finely crystalline; yellowish grey to grey, weathering yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; faintly laminated and slightly silty.				
	Basal contact gradational, continuous.	9.0	(29.5)	309.5	
22	Dolostone: resistant; medium crystalline; dark brownish grey, weathering dark brown; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; a fetid and vuggy stromatoporoid and coral biolithite; some definite bioherms about 20 m broad and 1 m thick; some silicification of fossils; basal contact abrupt.	12.0	(39.4)	300.5	
21	Dolostone: resistant; finely crystalline; light greyish yellow, weathering light yellow; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; laminated with a little ripple cross-stratification, one bed of peculiar concave-upward algal(?) laminations; basal contact gradational, continuous.	9.0	(29.5)	288.5	
20	Dolostone: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; weakly laminated, abundant small vugs of partly leached articulated brachiopods; basal contact abrupt.	13.5	(44.3)	279.5	
19	Dolostone: slightly recessive; finely crystalline; yellow, weathering yellowish orange; bedding planar, mode thin bedded; minimum very thin bedded, maximum thin bedded; fine laminae of silt and fine sand; basal contact abrupt.	10.5	(34.4)	266.0	
18	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; some wavy beds with brachiopod molds; some argillaceous material, grading upward to dolostone B.				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Dolostone B: moderately resistant; finely crystalline; yellowish grey, weathering greyish yellow; bedding planar, mode laminated, minimum very thin bedded, maximum very thin bedded; thinly laminated with some silty and argillaceous material.				
	Basal contact gradational, continuous.	15.0	(49.2)	255.5	
17	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B).				
	Dolostone A: slightly recessive; finely crystalline; yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; some silty and stromatolitic laminations.				
	Dolostone B: resistant; finely to coarsely crystalline; dark greyish brown, weathering dark brown; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; fetid and vuggy stromatoporoid and coral biolithite; some bioherms as in overlying units; some amphiporid beds; fossils silicified; vugs occluded with dogtooth quartz.				
	Basal contact abrupt.	51.0	(167.3)	240.5	
16	Limestone and dolostone (65 per cent limestone, 35 per cent dolostone).				
	Limestone: resistant; pelletal and intraclast packstone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded.				
	Dolostone: moderately resistant; finely crystalline; colour buff, weathering yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; some finely laminated with silt laminae; most of this lithology occurs at the top of the unit.				
	Basal contact gradational, continuous.	30.0	(98.4)	189.5	
15	Limestone A and limestone B (50 per cent limestone A, 50 per cent limestone B).				
	Limestone A: slightly recessive; pelletal calcilutite; medium grey, weathering medium- to light-grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; laminated and platy with thin argillaceous partings.				
	Limestone B: resistant; pelletal calcilutite; dark grey, weathering dark to medium grey; bedding planar, mode thinly laminated, minimum thinly laminated, maximum laminated; smooth to slight lumpy bed surfaces, interbedded with limestone A.				
	Basal contact gradational, continuous.	7.5	(24.6)	159.5	
14	Limestone: resistant; pelletal calcilutite; dark grey, weathering medium grey; bedding planar to wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; very homogeneous pelletal lime mudstone; basal contact gradational, continuous.	6.0	(19.7)	152.0	
	Total thickness of the Corridor Member of the Camsell Formation is 914.0 m (2998.7 ft).				
	Vera Formation				
13	Limestone: recessive; platy pelletal(?) calcilutite; dark grey, weathering pinkish grey and pink and greenish grey; bedding planar, mode laminated, minimum thinly laminated, maximum very thin bedded; abundant argillaceous material along partings; basal contact abrupt.	4.5	(14.8)	146.0	(479.0)
12	Limestone: slightly recessive; platy pelletal(?) calcilutite; dark grey, weathering pinkish grey; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; abundant argillaceous material in bed partings; basal contact gradational, continuous.	10.5	(34.4)	141.5	
11	Limestone: moderately resistant; flaggy pelletal(?) cacilutite; dark grey, weathering medium- to dark-grey; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; very homogeneous; basal contact gradational, continuous.	6.0	19.7	131.0	
10	Limestone (50 per cent exposed): recessive; pelletal calcilutite; dark grey, weathering dark- to medium-grey and greenish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; bioturbated with some fine skeletal debris; abundant argillaceous material; basal contact gradational, continuous.	21.0	(68.9)	125.0	
9	Limestone (70 per cent exposed): slightly recessive; fossiliferous and pelletal wackestone; dark grey, weathering dark grey mottled yellowish orange; bedding crinkly to nodular, mode thin bedded, minimum thin bedded, maximum thin bedded; abundant brachiopods, gastropods and thin finger corals; pockets and partings of orange-weathering argillaceous material; basal contact gradational, continuous. GSC loc. C-032607 (see Appendix 2).	7.5	(24.6)	104.0	
8	Limestone (70 per cent exposed): recessive; pelletal(?) calcilutite; dark grey, weathering dark to medium grey and greenish grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; a few brachiopod-bearing horizons; argillaceous and silty partings; basal contact gradational, continuous.	18.0	(59.1)	96.5	
7	Limestone (80 per cent exposed): moderately resistant; pelletal wackestone; dark grey, weathering dark to medium grey with orange mottlings; bedding wavy, mode thin bedded, minimum very thin bedded, maximum medium bedded; a few scattered brachiopods; silty and argillaceous; basal contact gradational, continuous.	25.5	(83.7)	78.5	
6	Limestone (50 per cent exposed): recessive; fossiliferous and pelletal wackestone; dark grey, weathering dark grey mottled orange (overall dull, orangish yellow); bedding crinkly but even with lumpy bed surfaces, mode thin bedded, minimum thin bedded, maximum medium bedded; abundant brachiopods, ostracodes, and gastopods both high spired and planispiral; some fish fragments; argillaceous seams tend to be dolomitized; basal contact gradational, continuous.	22.5	(73.8)	53.0	
5	Limestone (70 per cent exposed): moderately resistant; pelletal and fossiliferous wackestone; dark grey, weathering dark greyish brown mottled pink and orange; bedding lenticular with lumpy bed surfaces; abundant, disarticulated brachiopods on bed surfaces; argillaceous seams weather pink and orange; basal contact abrupt.	11.0	(36.1)	30.5	
4	Limestone: resistant; pelletal and intraclast packstone and grainstone; light grey, weathering light grey; bedding wavy on a large scale, mode thick bedded, minimum medium bedded, maximum thick bedded; vague trough crossbeds several metres broad; some crinoids; basal contact gradational, continuous.	6.0	(19.7)	19.5	
3	Limestone: resistant; pelletal and intraclast packstone and grainstone; light grey, weathering light grey, bedding wavy, mode medium bedded, minimum thin bedded,				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	maximum thick bedded; large trough cross-stratification is evident; no fossils; slightly dolomitized; basal contact gradational, continuous.	6.0	(19.7)	13.5	
2	Limestone: resistant; pelletal and intraclast packstone and grainstone; light grey, weathering light grey; bedding wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; thin beds in lower part of unit; a few ostracode and crinoid fragments; small amount of dolomite and quartz silt; basal contact gradational, continuous.	4.5	(14.8)	7.5	
1	Limestone: resistant; pelletal and intraclast packstone; light grey, weathering light grey; bedding wavy, mode thick bedded, minimum medium bedded, maximum thick bedded; some possible crinoids; basal contact at a fault.	3.0	(9.8)	3.0	
	Incomplete thickness of the Vera Formation is 146.0 m (479.0 ft).				
	Total thickness of the Tundra Ridge 1 Section is 2161.5 m (7091.5 ft).				

TUNDRA RIDGE 2 SECTION

SECTION 19. This section is a west-dipping section that extends westward across the north end of Tundra Ridge and is immediately east of Section 18. It begins at Lat. 61°52'N; Long. 124°46'W in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. This section and accompanying paleontological identifications were supplied by Banff Oil Ltd. (Section B.G.-6-68).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
6	Limestone: moderately resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding planar, uniformly medium bedded; this unit contains a diverse fauna of corals (*Favosites, Coenites, Socialophyllum, Xystriphyllum,* and *Billingsastraea*), crinoids, brachiopods (*Spinatrypa, Desquamatia, Loxonema, Spinulicosta, Emanuella*, spiriferids and stropheodontids), trilobites, and gastropods both as fragments and in place; pelletal wackestone matrix.	114.0	(374.0)	876.5	(2875.7)
5	Limestone: resistant to moderately resistant; fossiliferous wackestone; dark grey to black, weathering dark grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; corals and hemispheriodal stromatoporoids predominate; thick bedded coral and stromatoporoid-bearing intervals alternate with more recessive medium bedded, slightly argillaceous intervals that contain abundant brachiopods; these medium bedded intervals are shaly towards the base of the unit; basal contact abrupt.	117.0	(383.9)	762.5	
	Incomplete thickness of the Nahanni Formation is 231.0 m (757.9 ft).				
	Headless Formation				
4	Limestone and shale (80 per cent exposed, 60 per cent limestone, 40 per cent shale).				
	Limestone: slightly recessive; argillaceous wackestone; dark greenish grey, weathering dark greenish grey; bedding planar to irregular or wavy and indistinct, mode medium bedded, minimum thin bedded, maximum thick bedded; moderately abundant brachiopods, trilobites, ostracodes and crinoids, commonly in small lenses.				
	Shale: recessive; calcareous; greyish brown, weathering yellowish brown; planar, thin laminated to wavy bedding; shale occurs as interbeds from a few metres to tens of metres thick throughout this unit.				
	Basal contact abrupt.	177.0	(580.7)	645.5	
	Total thickness of the Headless Formation is 177.0 m (580.7 ft).				
	Funeral Formation				
3	Limestone: moderately resistant; argillaceous wackestone and calcilutite; brownish grey, weathering medium greyish brown; bedding planar and smooth, mode thin bedded, minimum laminated, maximum thin bedded; moderately fossiliferous with brachiopods (*Desquamatia aperanta, Gypidula* and *Spinatrypa*), gastropods, crinoids ostracodes and bryozoans; basal contact gradational, continuous.	53.0	(173.9)	468.5	(1537.1)
2	Shale (70 per cent exposed): recessive; calcareous; dark- to medium-brownish grey, weathering medium brown to yellowish brown; silty, in part a siltstone; bioclastic crinoid and brachiopod-bearing (*Desquamatia aperanta*) beds appear in some intervals; tentaculites occur on some shale bed surfaces; basal contact abrupt.	413.0	(1355.0)	415.5	
	Total thickness of the Funeral Formation is 466.0 m (1528.9 ft).				
	Arnica Formation				
1	Dolostone: resistant; finely to medium crystalline; light to medium brownish grey, weathering light to medium brownish grey; bedding planar, medium bedded; scattered "slotted" and possible two-holed crinoids.	2.5	(8.2)	2.5	(8.2)
	Incomplete thickness of the Arnica Formation is 2.5 m (8.2 ft).				
	Total thickness of the Tundra Ridge 2 Section is 876.5 m (2875.7 ft).				

SOUTH TUNDRA 1 SECTION

SECTION 22. This is an east- to northeast-dipping section measured eastward across the south end of the Tundra Ridge beginning at Lat. 61°44'N; Long. 124°46'W, (or 6856000N, 406400E in UTM coordinates) in NTS map sheet 95F (Virginia Falls) in the District of Mackenzie, N.W.T. The section is best seen in RCAF air photo A17441-089. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Sombre Formation				
55	Dolostone (25 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; poor dip slope exposure; basal contact gradational, continuous.	140.0	(459.3)	2305.0	(7562.3)
54	Dolostone (5 per cent exposed, 100 per cent dolostone): finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; almost a covered interval; basal contact gradational, continuous.	54.0	(177.1)	2165.0	
53	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering very light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; many medium grey beds contain abundant, leached, moldic porosity after amphiporid-like corals (spaghetti rock); basal contact gradational, continuous.	117.0	(384.9)	2111.0	
52	Dolostone (80 per cent exposed): finely crystalline; light grey, weathering very light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; featureless dolomite with some moldic porosity; basal contact gradational, continuous.	78.0	(255.9)	1994.0	
51	Dolostone (5 per cent exposed, 100 per cent dolostone): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; dark beds				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	commonly contain some moldic vug porosity from leached brachiopods or corals; basal contact gradational, continuous.	45.0	(147.6)	1916.0	
50	Dolostone (90 per cent exposed): resistant; finely to medium crystalline; medium- to light-grey, weathering medium- to light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; light and medium grey beds are interbedded with vugs of enlarged moldic porosity in bands parallel to bedding; crinoids, thamnoporid-like corals, bryozoans and colonial favositid-like corals; basal contact gradational, continuous. GSC loc. C-052746 (see Appendix 2).	42.0	(137.8)	1871.0	
49	Dolostone (5 per cent exposed): finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; similar to Unit 19 but medium grey beds are less abundant; basal contact gradational, continuous.	31.5	(103.3)	1829.0	
48	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; almost entirely light grey, feature-less dolostone with some thin zones of vugs parallel to bedding; beds near base of unit are brecciated; large, angular blocks of host dolostone in a matrix of dolomitized lime mud and white dolomite cement form the breccia; boundaries of breccia body cannot be distinguished clearly; basal contact gradational, continuous.	61.5	(201.8)	1797.5	
47	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some small, irregular, breccia bodies several metres across; breccia clasts up to 20 cm long of host dolomite in a carbonate mud and white dolomite cement matrix; basal contact gradational, continuous.	64.5	(211.6)	1736.0	
46	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some small zones of vugs parallel to bedding; vugs probably enlarged moldic porosity; basal contact gradational, continuous.	45.0	(147.6)	1671.5	
45	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light- to very light-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; similar to Unit 37; basal contact gradational; continuous.	60.0	(196.9)	1626.5	
44	Dolostone (75 per cent exposed): finely crsytalline; light- to medium-grey, weathering light- to very light-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; some large, tabular, breccia bodies between well-bedded intervals in the unit; angular, poorly sorted, breccia clasts up to or more than 1 m long in a dolomicrite matrix; although clasts are densely concentrated, the breccia fabric does not appear to be grain-supporting; some clasts appear to have undergone plastic deformation and appear to be aligned parallel to bedding; basal contact gradational, continuous.	37.5	(123.0)	1566.5	
43	Dolostone: finely crystalline; light- to medium-grey, weathering light- to very light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; same as Unit 35 with intervals of nonbedded breccia; basal contact gradational, continuous.	28.5	(93.5)	1529.0	
42	Dolostone (80 per cent exposed): finely crystalline; light grey, weathering light- to very light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; some breccia zones like those in units 43 and 44; basal contact gradational, continuous.	51.0	(167.3)	1300.5	
41	Dolostone (80 per cent exposed): finely crystalline; light- to medium-grey, weathering light- to very light-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; similar to Unit 33 but not as thickly bedded; angular breccia fragments are rimmed by isopachous cement but some are floating in a lime mud matrix; basal contact gradational, continuous.	22.5	(74.1)	1449.5	
40	Dolostone (3 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; very poorly exposed unit; dolostone like that in Unit 32; basal contact gradational, continuous.	52.5	(172.2)	1427.0	
39	Dolostone (10 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; poorly exposed; basal contact gradational, continuous.	78.0	(255.9)	1374.5	
38	Dolostone A and dolostone B (80 per cent exposed, 85 per cent dolostone A, 15 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; dark- to light-grey, weathering dark- to light-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; cycles of dark dolomite grading upwards to light faintly colour laminated dolomite; some cycles capped by dolostone B.				
	Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering medium- to light-yellowish grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum medium bedded; interbedded with dolostone A as the upper part of cycles of grey dolomite grading upwards to yellow dolomite; slightly silty and argillaceous.				
	Basal contact gradational, continuous.	48.0	(157.5)	1296.5	
37	Dolostone A and dolostone B (80 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey, bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; similar to dolostone A of Unit 29.				
	Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; similar to dolostone B of Unit 29 but faintly laminated; cycles of dolostone A interbedded with dolostone B.				
	Basal contact gradational, continuous.	63.0	(206.7)	1248.5	
36	Dolostone (60 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; large parts of unit may be breccia as at Unit 44 but poor exposure makes the extent of breccias uncertain; in thin section indistinct, but pervasive fragmental texture with little or no open space-filling; a few darker fragments with calcispheres; basal contact gradational, continuous.	51.0	(167.3)	1185.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
35	Dolostone A and dolostone B (40 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B). Dolostone A: finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; medium grey dolostone grading upwards to light grey dolostone as in Unit 27. Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; slightly silty and finely laminated; dolostone B caps cycles as in Unit 27. Basal contact gradational, continuous.	18.0	(59.1)	1130.5	
34	Dolostone (10 per cent exposed): appears to be similar to Unit 24; perhaps mainly recessive; silty, yellowish grey dolostone; basal contact gradational, continuous.	34.5	(113.2)	1116.5	
33	Dolostone A and dolostone B (80 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B). Dolostone A: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; dark grey dolostone grades upward to light grey dolostone in several cycles producing a strongly colour-banded unit; light grey dolostone is slightly colour-laminated with some penecontemporaneous mud chip breccias. Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; silty and finely laminated dolomite that caps cycles of dark-light grey dolostone. Basal contact gradational, continuous; in thin section many laminae have eroded basal contacts, a few ostracodes.	82.5	(270.7)	1082.0	
32	Dolostone (5 per cent exposed, 100 per cent dolostone): finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; very poorly exposed; basal contact gradational, continuous.	73.0	(239.5)	999.5	
	Total thickness of the Sombre Formation is 1378.5 m (4522.6 ft).				
	Camsell Formation *(Corridor Member)*				
31	Dolostone (20 per cent exposed): finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; poorly exposed unit in a saddle; there may be some silty, yellow dolomite as in underlying units interbedded with the grey dolomite of this unit; basal contact gradational, continuous.	36.0	(118.1)	926.5	(3039.7)
30	Dolostone (30 per cent exposed): finely crystalline; light- to dark-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; mainly light grey, faintly colour-laminated (shades of grey) dolomite with a few interbeds of dark grey featureless dolomite; basal contact gradational, continuous.	32.5	(172.2)	890.5	
29	Dolostone: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded light grey, faintly laminated and dark grey dolostone cycles; dark grey dolostone beds grade upward to light grey dolostone and overlie light grey dolostone with erosional contacts, eroded chips of light grey dolomite occur near the base of many dark grey beds; one large cross-cutting breccia sheet with poorly sorted, angular to rounded fragments up to 0.75 m long; in thin section angular, irregular fragments in a carbonate silty matrix; some fragments are sandy; many fragments are themselves breccias; basal contact gradational, continuous.	48.0	(157.5)	858.0	
28	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B). Dolostone A: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; cycles of dark grey beds grading upwards to light grey. Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light yellowish grey to greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; platy weathering with abundant quartz silt; disseminated limonite imparts a yellow colour; this lithology occurs as thin interbeds between beds of dolostone A. Basal contact gradational, continuous.	18.0	(59.1)	790.0	
27	Dolostone (10 per cent exposed): recessive; finely crystalline; dark brownish grey, weathering dark- to medium-brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; poor exposure of vuggy dolomite with chert lenses; vugs may be enlarged moldic porosity; basal contact gradational, continuous.	87.0	(285.4)	772.0	
26	Dolostone A and dolostone B (20 per cent exposed, 80 per cent dolostone A, 20 per cent dolostone B). Dolostone A: finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; faintly laminated with some medium grey interbeds. Dolostone B: recessive; finely crystalline; impurities, silt; medium yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; finely laminated with abundant quartz silt and some argillaceous bed partings; mudcracks on some bed surfaces; interbedded with dolostone A. Basal contact gradational, continuous.	84.0	(275.6)	685.0	
25	Dolostone: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey, bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; light grey and dark grey dolostones are interbedded as in Unit 29, with light grey predominating; this unit and Unit 24 forms a resistant grey marker in the upper part of the Camsell Formation; basal contact gradational, continuous.	16.5	(54.1)	601.0	
24	Dolostone: finely crystalline; light- to dark-brownish grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; light grey and dark grey dolostones are interbedded as in Unit 29; light grey dolostone is faintly laminated whereas dark dolostone is very vuggy in places and has a strongly fetid odour				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	(bituminous); vugs up to 5 cm across; fibrous quartz needles line some vugs; basal contact gradational, continuous.	7.5	(24.6)	584.5	
23	Dolostone (20 per cent exposed): recessive; finely crystalline; light yellowish grey, weathering light greyish yellow; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; abundant quartz silt and argillaceous partings; some bed surfaces are mudcracked and some have salt crystal casts; possibly some grey dolomite also occurs in this poorly exposed unit; basal contact gradational, continuous.	51.0	(167.3)	577.0	
22	Dolostone (50 per cent exposed): recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; abundant quartz silt with argillaceous bed partings; basal contact gradational, continuous.	1.0	(3.3)	526.0	
21	Dolostone (5 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; a very poorly exposed unit, mainly blocky scree on a dip slope; basal contact gradational, continuous.	49.5	(162.4)	525.0	
20	Dolostone (10 per cent exposed): very finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; abundant quartz silt (10-15 per cent) and argillaceous bed partings; irregularly and finely laminated beds; basal contact gradational, continuous.	45.0	(147.6)	475.5	
19	Dolostone (90 per cent exposed): slightly recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant quartz silt, laminated (algal?) with small teepee structures; some mudcracks on bed surfaces; basal contact gradational, continuous.	4.5	(14.8)	430.5	
18	Dolostone (100 per cent exposed): recessive; finely crystalline; medium grey, weathering light yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; some quartz silt but otherwise featureless; basal contact gradational, continuous.	18.0	(59.1)	426.0	
17	Dolostone (90 per cent exposed): recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; quartz silt in thin partings that weather orangish yellow; finely laminated; some irregular laminae appear to be algal; basal contact gradational, continuous.	19.5	(64.0)	408.0	
16	Dolostone (10 per cent exposed): resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; dark grey dolostone beds grade upwards to light grey beds; basal contact gradational, continuous.	27.0	(88.6)	388.5	
15	Dolostone (20 per cent exposed): finely crystalline, some clay; medium yellowish brown, weathering light yellowish brown to yellowish orange; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; very homogeneous with some thin, orange, argillaceous seams (limonitic); basal contact gradational, continuous.	66.0	(216.5)	361.5	
14	Dolostone: resistant; finely crystalline; medium yellowish brown, weathering light yellowish brown to yellowish orange; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; similar to Unit 15 but more resistant; bed surfaces are rather knobbly; basal contact gradational, continuous.	30.0	(98.4)	295.5	
13	Dolostone: recessive; finely crystalline; medium yellowish grey, weathering light yellowish grey; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; abundant, thin, argillaceous partings; some poorly developed fenestral fabric; good fenestral laminae in thin section; basal contact gradational, continuous.	27.0	(88.6)	265.5	
12	Dolostone (50 per cent exposed): very finely crystalline; medium yellowish grey, weathering light yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; similar to Unit 13; basal contact gradational, continuous.	19.5	(64.0)	238.5	
11	Dolostone: finely crystalline; light yellowish grey to yellowish brown, weathering light yellow grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; some laminated beds; basal contact gradational, continuous.	13.5	(44.3)	219.0	
10	Dolostone: resistant; finely crystalline; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some lenses of dolomitized, crinoidal wackestone similar to that in the underlying Delorme Formation; basal contact gradational, continuous.	19.5	(64.0)	205.5	
	Total thickness of the Camsell Formation (Corridor Member) is 926.5 m (3039.7 ft).				
	Vera Formation				
9	Dolostone: resistant; finely to very finely crystalline; dark- to medium-grey, weathering light- to medium-brownish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; a slightly argillaceous dolomite with pinkish limonite stain in bed partings; a breccia (a subvertical pipe) up to 0.5 m broad, passes through this unit; breccia of angular to rounded fragments of the host rock with fragments up to 20 cm across; white dolomite is interfragment cement; in thin section grain supported subangular to subrounded; basal contact gradational, continuous.	16.5	(54.1)	186.0	(610.2)
8	Dolostone: slightly recessive; finely crystalline; dark- to medium-brownish grey, weathering medium brownish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; planar but slightly irregular to wavy; with yellowish orange argillaceous partings; some silicified skeletal material, brachiopods and gastropods; basal contact gradational, continuous.	31.5	(103.4)	169.5	
7	Dolostone: slightly recessive; finely crystalline; medium- to dark-grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; slightly calcareous with shaly and argillaceous partings; abundant silicified corals and bryozoans near top of unit; brachiopods and corals common; a little moldic porosity with a partial infilling of drusy quartz; basal contact gradational, continuous. GSC loc. C-052709 (see Appendix 2).	18.0	(59.1)	138.0	
6	Limestone: resistant; crinoidal wackestone; dark grey, weathering medium grey; bedding planar, mode				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	thin bedded, minimum thin bedded, maximum medium bedded; crinoid ossicles are abundant in weakly developed, low amplitude trough crossbeds within beds; slightly dolomitized, less argillaceous than units 8 and 9; basal contact gradational, continuous. GSC loc. C-052708 (see Appendix 2).	9.0	(29.5)	120.0	
5	Dolostone: resistant; finely to medium crystalline; medium grey, weathering medium grey; bedding lenticular, mode thin bedded, minimum thin bedded, maximum medium bedded; unfossiliferous beds alternate with crinoid- and bryozoan-rich beds; a dolomitized wackestone and crinoidal wackestone; some streaks of yellow weathering, argillaceous material and 10 to 20 per cent quartz silt, argillaceous partings; basal contact gradational, continuous.	27.0	(88.6)	111.0	
6	Limestone (10 per cent exposed): crinoidal wackestone; medium yellowish grey, weathering light yellowish grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; very poorly exposed, fossiliferous limestone with abundant crinoid ossicles; probably interbedded with shale and siltstone intervals of the Cadillac Formation; basal contact gradational, continuous.	24.0	(78.7)	84.0	
	Total thickness of the Vera Formation is 126.0 m (413.4 ft).				
	Cadillac Formation				
3	Shale (5 per cent exposed): recessive; modal class clay, minimum class clay, maximum 5 per cent 0.05 mm; medium to dark grey with brownish yellow streaks; weathering light yellow and grey; matrix more than 20 per cent; quartz less than 90 per cent; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; interlaminated yellow and grey with argillaceous material predominating in the yellow laminae; the dark grey laminae are very calcareous and more resistant than the shaly layers; basal contact abrupt.	48.0	(157.5)	60.0	(196.9)
2	Limestone: resistant; argillaceous skeletal wackestone; medium grey, weathering light- to medium-grey; bedding planar, mode medium bedded; minimum thin bedded, maximum medium bedded; a slightly argillaceous limestone with an abundant and diverse, predominantly benthonic fauna dominated by very large crinoids with ossicles up to 3 or 4 cm across; basal contact abrupt. GSC loc. C-052706 (see Appendix 2).	6.0	(19.7)	12.0	
1	Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.06 mm; medium- to dark-grey with brownish yellow streaks, weathering yellow and grey; matrix more than 20 per cent, quartz less than 90 per cent; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; very similar to shale in Unit 3; slightly wavy bedding may reflect soft sediment deformation during sedimentation; this unit might be considered to mark the top of the Road River (transitional to Cadillac), A.W. Norris measured 61.0 m of silty shale of the Road River Formation beneath this unit; basal contact gradational, continuous.	6.0	(19.7)	6.0	
	Incomplete thickness of the Cadillac Formation is 60.0 m (196.9 ft).				
	Total thickness of the South Tundra Section is 2305.0 m (7562.3 ft).				

SOUTH TUNDRA 8 SECTION

SECTION 23. This is a gently east-dipping section that begins at Lat. 61°39'N; Long. 124°44'W (or 6836000N, 408450E in UTM coordinates). It extends eastward across the southward continuation of Tundra Ridge in the northeast quadrant of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is best shown in RCAF air photo A17440-031. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Cadillac Formation				
19	Limestone (40 per cent exposed): moderately recessive; silty calcilutite; medium- to dark-brownish orange, weathering orange; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; rather platy; basal contact abrupt.	105.0	(344.5)	717.0	(2352.4)
18	Dolostone: resistant; finely to medium crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; featureless dolomite (perhaps a breccia, but difficult to discern distinct clasts), basal contact abrupt.	15.0	(49.2)	612.0	
17	Dolostone and shale (95 per cent dolostone, 5 per cent shale).				
	Dolostone: recessive; finely crystalline; dark brown, weathering medium- to dark-brown; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy, argillaceous and silty, this dolostone is almost a shale in places.				
	Shale: dolomitic; modal class clay, minimum class clay, maximum 5 per cent 0.06 mm; dark brown, weathering medium- to dark-brown; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; scattered small bioherms (1 m high and ~5-10 m broad) are scattered throughout the more shaly parts of this unit; these dolomitized bioherms are fetid with a silicified fauna of small corals, mainly thamnoporid-like; basal contact abrupt.	84.0	(275.6)	597.0	
16	Dolostone A and dolostone B (80 per cent dolostone A, 20 per cent dolostone B).				
	Dolostone A: moderately resistant; medium crystalline; dark- to light-grey, weathering dark- to light-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; argillaceous and fossiliferous in parts with abundant lamellar stromatoporoids, crinoids and corals; dolostone A appears to be part of a single large biostrome or bioherm that pinches out along strike.				
	Dolostone B: recessive; finely crystalline; dark brown, weathering dark brown; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; platy and shaly; laminated, cherty dolomite that caps the biostrome formed by dolostone A.				
	Basal contact abrupt.	31.5	(103.3)	513.0	
15	Dolostone: resistant; medium crystalline; medium grey, weathering light grey; bedding planar but poorly defined, mode medium bedded, minimum thin bedded, maximum thick bedded, crinoidal dolomite containing several light grey debris flows formed of angular fragments up to 0.5 m long, crudely aligned parallel to bedding; these flows have torn up darker dolomite clasts from beneath their abrupt, erosional, basal contacts.	12.0	(39.4)	481.5	
14	Dolostone: moderately recessive; finely to medium crystalline; dark brown, weathering medium- to dark-brown; bedding planar, mode very thin bedded, minimum very thin bedded, platy and faintly laminated; abundant silt and argillaceous material; basal contact gradational, continuous.	6.0	19.7	469.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
13	Dolostone (60 per cent exposed): resistant; medium crystalline; light grey, weathering light grey; bedding planar but indistinct, mode medium bedded, minimum thin bedded, maximum thick bedded; slightly argillaceous and crinoidal with some intervals of slump breccia (angular clasts in a mud supported matrix); some yellow mottling due to presence of weathered argillaceous material; basal contact gradational, continuous.	78.0	(255.9)	463.5	
12	Dolostone: moderately recessive; finely to medium crystalline; dark grey, weathering dark brownish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; almost a shale with poorly preserved graptolites and brachiopods; basal contact gradational, continuous.	30.0	(98.4)	385.5	
11	Dolostone: resistant; medium crystalline; light grey, weathering light grey; bedding planar, indistinct, mode thick bedded; minimum medium bedded, maximum very thick bedded; crinoidal, with abundant, large, dolomitized, lime mud fragments (this entire unit may be a debris flow or series of debris flows); basal contact gradational, continuous.	33.0	(108.3)	355.5	
10	Dolostone: resistant; medium to coarsely crystalline; light grey, weathering light greyish yellow to orange; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; a dolomitized crinoid packstone, some poorly graded beds up to 0.5 m thick; some selective silicification of crinoids; basal contact abrupt.	16.5	(54.1)	322.5	
9	Shale: recessive; minimum class clay, modal class clay, maximum 5 per cent 0.06 mm; dark brown, weathering dark greyish brown; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and dolomitic; basal contact gradational, continuous.	15.0	(49.2)	306.0	
8	Dolostone (80 per cent exposed): resistant; finely crystalline; light grey, weathering light grey; bedding planar, indistinct, mode very thick bedded, minimum very thick bedded, maximum nonbedded; abundant, poorly preserved corals and crinoids; some intervals with slump breccias of angular blocky to platy clasts; coarsely crystalline, white dolomite with bitumen-lined vugs in some breccia clasts; some shelter pores; basal contact gradational, continuous.	42.0	(137.8)	291.0	
7	Sandstone: moderately recessive; modal class fine sand, minimum class silt; white, weathering light grey; dolomite-cemented quartz-arenite, bedding planar smooth and distinct, mode thin bedded, minimum very thin bedded, maximum thin bedded; this sand unit thins northward to an insignificant thickness in less than 200 m; basal contact gradational, continuous.	7.5	(24.6)	249.0	
6	Shale and limestone (50 per cent exposed, 60 per cent shale, 40 per cent limestone). Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.10 mm; black to dark grey, weathering dark grey; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; some thin, discontinuous, brownish grey, silt laminae scattered throughout this shale. Limestone: resistant; medium crystalline; medium grey, weathering medium yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; a recrystallized, crinoid packstone with wavy to lenticular shaly partings; graded silty crinoid packstone intervals less than 0.25 m thick are interbedded with shale in the upper part of the unit.				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Basal contact gradational, continuous.	6.0	(19.7)	241.5	
5	Sandstone: slightly recessive; modal class medium sand, minimum class silt, maximum 5 per cent 1.0 mm; light grey, weathering yellow to reddish brown; dolomite-cemented quartzarenite; bedding wavy, mode laminated, minimum thinly laminated, maximum very thin bedded; argillaceous and hematitic; ripples and crenulated laminae outlined by hematitic seams; some phosphatic fishhead fragments; basal contact gradational, continuous. GSC loc. C-059243 (see Appendix 2).	24.0	(78.7)	235.5	
4	Shale and limestone (40 per cent exposed, 80 per cent shale, 20 per cent limestone). Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.06 mm; medium brown, weathering yellowish brown; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and dolomitic, could be called a platy dolomite. Limestone: resistant; silty and finely crystalline wackestone; medium grey, weathering light- to medium-grey; bedding wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; crinoid wackestone and packstone beds interbedded with shale.				
	Basal contact gradational, continuous.	55.5	(182.1)	211.5	
	Incomplete thickness of the Cadillac Formation is 561.0 m (1840.6 ft).				
	Road River Formation				
3	Shale (70 per cent exposed): recessive; modal class clay, minimum class clay; dark grey, weathering medium yellowish grey; bedding planar, mode laminated, minimum thinly laminated, maximum very thin bedded; some black shale but mostly lighter coloured calcareous shale; some pinch and swell bedding; basal contact gradational, continuous.	78.0	(255.9)	156.0	(511.8)
2	Limestone and shale (40 per cent exposed, 70 per cent limestone, 30 per cent shale). Limestone: slightly resistant; finely crystalline calcilutite; medium grey, weathering light- to medium-yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; argillaceous and faintly laminated. Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.06 mm; medium yellowish grey; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; almost cyclic interbeds of shale and calcilutite; some poorly preserved possible graptolitic shale.				
	Basal contact gradational, continuous.	54.0	(177.2)	78.0	
1	Limestone A and limestone B (40 per cent exposed, 60 per cent limestone A, 40 per cent limestone B). Limestone A: argillaceous calcilutite; medium yellowish grey, weathering medium yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded. Limestone B: slightly silty; crinoidal, argillaceous wackestone; dark grey, weathering medium grey; bedding planar, smooth and distinct, mode thin bedded, minimum thin bedded, maximum medium bedded; a few scattered corals and brachiopods.				
	Basal contact abrupt.	24.0	(78.7)	24.0	
	Incomplete thickness of the Road River Formation is 156.0 m (511.8 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Total thickness of the South Tundra 8 Section is 717.0 m (2352.4 ft).				

SOUTH TUNDRA 6 SECTION

SECTION 29. This is an east-dipping section that begins at Lat. 61°39'N; Long. 129°43'W (or 6835250N, 408750E in UTM coordinates). It extends eastward across the southern extension of Tundra Ridge in the north-central part of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is well shown in RCAF air photo A17440-031.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Sombre Formation				
29	Dolostone (80 per cent exposed): resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; a few vuggy beds of leached biogenic material; basal contact gradational, continuous.	146.0	(479.0)	1630.0	(5347.8)
28	Dolostone: resistant; finely to medium crystalline; medium grey, weathering medium- to light-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; very uniform dolomite with some vuggy beds containing leached biogenic material; some beds contain pockets of solution-collapse breccia containing angular to subrounded fragments cemented by coarsely crystalline, white dolomite. This and the overlying unit have a very massive appearance; basal contact gradational, continuous.	115.5	(378.9)	1484.0	
27	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; laminated, thin, stromatolitic beds interbedded with thick, somewhat vuggy, beds; some laminated beds weather brownish grey and are silty; a few thin zones contain solution-collapse breccias with angular fragments cemented by white dolomite; basal contact gradational, continuous.	69.0	(226.4)	1368.5	
26	Dolostone: resistant; finely crystalline; medium grey, weathering light- to medium- grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; abundant solution-collapse breccia with poorly-sorted, angular to subrounded fragments cemented by white, coarsely crystalline dolomite; brecciation best developed in beds with a large proportion of pre-existing vugs; basal contact gradational, continuous.	48.0	(157.5)	1299.5	
25	Dolostone: resistant; finely crystalline; medium- to light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; very uniform and featureless; a strongly resistant unit; basal contact gradational, continuous.	72.0	(236.2)	1251.5	
24	Dolostone: resistant; finely crystalline; light grey to yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; 6 or 7, thin, yellowish grey beds containing fenestral fabric are interbedded with otherwise featureless dolomite; basal contact gradational, continuous.	37.0	(121.4)	1179.5	
23	Dolostone A and dolostone B (90 per cent exposed, 70 per cent dolostone A, 30 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; featureless, medium grey dolomite tends to grade upwards to light grey laminite and finally to dolostone B in distinct cycles.				
	Dolostone B: slightly recessive; finely crystalline medium brownish grey, weathering medium brownish grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; argillaceous and slightly silty; some fenestral fabric, forms cycles with dolostone A.				
	Basal contact gradational, continuous.	46.5	(152.6)	1142.5	
	Incomplete thickness of the Sombre Formation is 534.0 m (1736.6 ft).				
	Cairnell Formation *(Corridor Member)*				
22	Dolostone A and dolostone B (65 per cent dolostone A, 35 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; slightly colour laminated; beds of dolostone A grade upwards to beds of dolostone B.				
	Dolostone B: recessive; finely crystalline, silty to slightly sandy; yellowish brown, weathering light brownish yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; silty and well laminated, with stringers of silt and fine quartzarenite and some fenestral fabric; some weakly developed, small-scale crossbedding in some beds of dolostone B.				
	Basal contact gradational, continuous.	107.5	(352.7)	1096.0	(3595.8)
21	Dolostone: light grey as in underlying unit but with abundant solution-collapse breccia; basal contact gradational, continuous.	40.5	(132.9)	988.5	
20	Dolostone: resistant; finely crystalline; light grey, weathering light grey to light yellowish grey; mode medium bedded, minimum thin bedded, maximum thick bedded; thin beds tend to weather yellowish grey, a little solution-collapse white dolomite-cemented mosaic and rubble breccia towards the top of the unit; basal contact gradational, continuous.	75.0	(246.1)	948.0	
19	Dolostone (100 per cent exposed): resistant; finely crystalline; light grey to yellowish grey, weathering light grey to yellow; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thinner beds are yellow-weathering and are silty with thin, orange, limonitic seams, some thick beds contain abundant vugs of leached biogenic material; basal contact gradational, continuous.	39.0	(128.0)	873.0	
18	Dolostone (90 per cent exposed): resistant; finely crystalline; light grey to yellow, weathering light grey to orangish yellow; bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; thick grey beds grade upwards to slightly recessive, silty, yellow, thin beds, with scattered specklings of reddish limonitized pyrite; basal contact gradational, continuous.	40.5	(132.9)	834.0	
17	Dolostone: resistant; finely crystalline; light grey to yellowish grey, weathering light grey to yellow; mode thick bedded, minimum thin bedded, maximum thick bedded; thick, grey, vuggy beds grade upwards to silty, yellow, slightly recessive, laminated, thin beds; some thin beds contain laterally linked hemispheriodal-type stromatolites; basal contact gradational, continuous.	24.0	(78.7)	793.5	
16	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Dolostone A: resistant; finely crystalline; light grey, weathering light grey to light yellow grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; vuggy, light grey beds grade upward to yellowish grey beds.				
	Dolostone B: slightly vuggy; slightly recessive; finely crystalline; greyish yellow, weathering light yellow; bedding wavy, mode thin bedded, minimum very thin bedded, maximum thin bedded; silty and argillaceous, laminated in part.				
	Basal contact gradational, continuous.	18.0	(59.1)	769.5	
15	Dolostone (50 per cent exposed): slightly resistant; finely crystalline; yellowish grey to grey, weathering light yellowish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; grey beds become yellowish grey upwards, some penecontemporaneous mud chip breccias; basal contact gradational, continuous.	40.5	(132.9)	751.5	
14	Dolostone (40 per cent exposed): slightly resistant; finely crystalline; yellowish grey, weathering light greyish yellow to yellowish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; slightly vuggy, yellowish grey beds become more yellow upwards; basal contact abrupt (Fault contact?).	79.5	(260.8)	711.0	
	Total thickness of the Corridor Member of the Camsell Formation is 464.5 m (1524.0 ft).				
	Cadillac Formation				
13	Dolostone (80 per cent exposed): slightly resistant; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; a dolomitized crinoidal and brachiopod wackestone, some thamnoporid-like corals; most fauna is silicified; some intervals of mud-supported, slump breccia with angular fragments; some individual beds are chaotic breccia and may have been slump deposits or debris flows; basal contact abrupt.	45.0	(147.6)	631.5	(2070.0)
12	Limestone: slightly recessive; silty and argillaceous calcilutite; medium grey to orange, weathering light grey to orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; orange to red, silty limestone interbedded with grey, dolomitic limestone in 3 to 4 m thick intervals; one or two isolated thin beds of crinoidal wackestone; basal contact gradational, continuous.	72.0	(236.2)	586.5	
11	Limestone (70 per cent exposed): recessive; platy; silvery grey and medium brown weathering; shaly limestone as in the underlying unit; basal contact gradational, continuous.	45.0	(147.6)	514.5	
10	Limestone (90 per cent exposed): slightly recessive; silty and argillaceous calcilutite; medium greyish brown, weathering light greyish brown; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; abundant brachiopods and silicified corals in a few thicker beds in this platy limestone unit; basal contact abrupt. GSC loc. C-059306 (see Appendix 2).	66.0	(216.5)	469.5	
9	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; intervals of breccia in this carbonate stratigraphic mound (other mounds are evident along this particular stratigraphic horizon) appear to be slump deposits with angular fragments in a mud-supported matrix; some coral-bearing beds containing thamnoporid-like corals and *Coenites*.				
	Dolostone B: recessive; silty, finely crystalline; dark brown, weathering medium brown; bedding planar, mode laminated, minimum laminated, maximum laminated; platy, slightly laminated.				
	Basal contact gradational, continuous.	93.0	(305.1)	403.5	
8	Dolostone A and dolostone B (80 per cent exposed, 60 per cent exposed dolostone A, 40 per cent dolostone B).				
	Dolostone A: resistant; finely to medium crystalline; medium- to light-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded. Most of this dolomite appears to occur in large, coarsely fragmental debris flows containing crudely aligned and chaotic breccia clasts, the largest observed clast was about 1 m across; the bases of these flows are erosional and platy clasts have been ripped up from underlying beds.				
	Dolostone B: slightly recessive; finely crystalline; dark grey, weathering dark grey to brownish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; laminated and crinoidal; platy fragments of this type of dolomite occur in debris flow deposits of dolomite A; large, pentamerid-like and other brachiopods occur in some beds.				
	Basal contact abrupt. GSC loc. C-059302 (see Appendix 2).	99.0	(324.8)	310.5	
7	Sandstone: moderately recessive; quartzarenite; modal class medium sand, minimum class silt; brown, weathering orange to reddish brown; well sorted, subrounded; bedding planar, very distinct, mode thin bedded, minimum very thin bedded, maximum thin bedded; discontinuous, shaly and hematitic partings define bedding; some thin beds are burrowed and ripple laminated, platy to flaggy; basal contact gradational, continuous.	27.0	(88.6)	211.5	
6	Sandstone and dolostone (60 per cent sandstone, 40 per cent dolostone).				
	Sandstone: moderately recessive; quartzarenite; modal class fine sand, minimum class clay; brown, weathering medium brown to dark reddish brown; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; thin, discontinuous black shaly partings of noncalcareous organic matter; some brachiopod shells; some vertical burrow fillings; in thin section coarser silt in burrows with sapropel; some small ripples, unit becomes more sandy upwards.				
	Dolostone: recessive; finely crystalline; light grey, weathering yellow; bedding planar, mode laminated, minimum laminated maximum very thin bedded; platy and silty.				
	Basal contact abrupt.	33.0	(108.3)	184.5	
5	Dolostone: resistant; finely crystalline; medium- to dark-grey, weathering medium- to dark-grey; bedding wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; beds that may have been dolomitized, crinoidal wackestone in beds that may have been mass or density flow deposits with graded bedding of crinoids, and alignment of crinoids; semi-lithified platy intraclasts occur along the bases of many beds; slightly argillaceous; basal contact abrupt.	36.0	(118.1)	151.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Total thickness of the Cadillac Formation is 516.0 m (1692.9 ft).				
	Road River Formation				
4	Limestone (50 per cent exposed): recessive; argillaceous calcilutite; medium grey to yellowish grey, weathering medium grey to light greyish yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; rhythmic bedding with relatively resistant, thin beds of grey calcilutite alternating with shaly, yellowish grey calcilutite; some recessive beds may be shale; basal contact gradational, continuous.	39.0	(128.0)	115.5	(379.0)
3	Calcilutite (50 per cent exposed): recessive; argillaceous; medium grey to yellowish grey, weathering medium grey to light greyish yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; slightly rhythmic bedding with resistant, thin beds of grey calcilutite alternating with recessive, shaly yellow beds; thicker beds towards the more resistant top of the unit; basal contact gradational, continuous. GSC loc. C-059295 (see Appendix 2).	33.0	(108.3)	76.5	
2	Limestone (50 per cent exposed): recessive; argillaceous calcilutite; medium grey, weathering medium grey to yellowish grey; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; argillaceous, yellowish grey laminae; separate thin, platy, calcilutite beds; some poorly-preserved, pyritized, monograptid-like graptolites; basal contact gradational, continuous.	28.5	(93.5)	43.5	
1	Limestone (80 per cent exposed): recessive; argillaceous calcilutite; dark grey, weathering medium grey; bedding planar, smooth to uneven, mode thin bedded, minimum very thin bedded, maximum thin bedded; weakly laminated with yellowish grey argillaceous partings; basal contact gradational, continuous.	15.0	(49.2)	15.0	
	Incomplete thickness of the Road River Formation is 115.5 m (378.9 ft).				
	Total thickness of South Tundra 6 Section is 1630.0 m (5347.8 ft).				

SOUTH TUNDRA 7 SECTION

SECTION 25. This is an east-dipping section that begins at Lat. 61°37'N; Long. 124°43'W (or 6831250N, 409100E in UTM coordinates). It extends eastward up the nose of a ridge that is part of a prominent high peak in the north-central part of the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is well shown in RCAF air photo A17428-086. This is a reference section for the Delorme Formation.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Camsell Formation (*Corridor Member*)				
17	Dolostone: resistant; finely crystalline; light yellowish grey, weathering light to medium yellow; slightly wavy, mode very thin bedded, minimum laminated, maximum very thin bedded; basal contact abrupt.	18.0	(59.1)	550.0	(1804.5)
16	Dolostone A and dolostone B (50 per cent dolostone A, 50 per cent dolostone B).				
	Dolostone A: moderately recessive; finely crystalline; light yellowish grey, weathering light to medium yellow; bedding wavy, mode very thin bedded, minimum very thin bedded, maximum thin bedded; interbedded with dolostone B.				
	Dolostone B: resistant; finely crystalline; dark- to medium-grey, weathering medium grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; grey beds grade upwards to yellow beds; basal contact gradational, continuous.	15.0	(49.2)	532.0	
	Incomplete thickness of the Corridor Member of the Camsell Formation is 33.0 m (108.3 ft).				
	Root River Formation				
15	Dolostone: slightly recessive; finely crystalline; dark grey, weathering dark grey; bedding planar to uneven, mode medium bedded, minimum thin bedded, maximum medium bedded; a dolomitized lime mudstone, bedding thinner and more uneven towards the top of the unit; basal contact gradational, continuous.	58.5	(191.9)	517.0	
14	Dolostone: slightly resistant; finely crystalline, finely featureless; medium- to dark-grey, bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational.	21.0	(68.9)	458.5	
13	Dolostone: slightly recessive; finely crystalline, featureless; dark- to medium-grey, weathering medium- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational, continuous.	75.0	(246.1)	437.5	
12	Dolostone: resistant; finely crystalline; medium yellowish grey, weathering light grey to light yellowish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded, some beds contain strings of small vugs (biogenic) parallel to bedding; basal contact gradational, continuous.	2.0	(6.6)	362.5	
11	Dolostone: resistant; cliff-forming, finely crystalline; dark- to medium-grey, weathering medium grey; uniformly planar, very thick bedded; abundant, large, robust *in situ* trimerellid-type brachiopods, many of which are partly leached and vuggy in places; bedding appears to be megalenticular.	33.0	(108.3)	360.5	
10	Dolostone: slightly recessive; finely crystalline; light yellowish grey to light grey, weathering light yellowish grey; bedding planar, uniformly medium bedded; biostromal with abundant partly leached and recrystallized, small, finger corals and/or stromatoporoids strung out parallel to bedding; basal contact gradational, continuous.	73.5	(241.1)	327.5	
9	Dolostone: resistant; cliff-forming, finely crystalline; light to dark grey, weathering light- to dark-grey; uniformly very thick bedded; a few interbeds of dark grey, dolomitized brachiopod wackestones with fragmented brachiopods in predominantly light grey, vuggy beds with abundant *in situ* robust and partly leached, trimerellid-like brachiopods (up to 20 cm long); basal contact gradational, continuous.	45.0	(147.6)	254.0	
8	Dolostone: slightly recessive; finely crystalline; light yellowish grey, weathering light yellowish grey to greyish yellow; smooth, mode medium bedded, minimum thin bedded, maximum medium bedded; several cycles (7 or 8) of large brachiopod-bearing beds grading upwards to featureless, more yellow-weathering dolomite; these brachiopodal beds exhibit some solution-collapse breccia; most brachiopods have been leached, forming a very vuggy rock; basal contact gradational, continuous.	36.0	(118.1)	209.0	
7	Dolostone: resistant; finely crystalline; medium grey, weathering medium to light grey; bedding planar, uniformly very thick bedded; large, robust, trimerellid brachiopods are abundant and appear to be mainly *in situ*; most are leached leaving large vugs; brachiopod shell material tends to weather orange; basal contact gradational, continuous. GSC loc. C-059399 (see Appendix 2).	18.0	(59.1)	173.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
6	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; very vuggy dolomite with abundant partly or completely leached brachiopods (trimerellid-like) strung out parallel to bedding, some small (3 m broad by 3 m high) mounds of packed, leached brachiopods are scattered throughout and have undergone some solution-collapse brecciation; basal contact gradational, continuous.	27.0	(88.6)	155.0	
5	Dolostone: resistant; finely crystalline; abundant, leached, trimerellid-type brachiopods form a very vuggy, reef-like dolomite; where biogenic vugs (up to 20 cm long) are particularly abundant there is some solution-collapse breccia cemented with white dolomite; basal contact gradational, continuous.	30.0	(98.4)	128.0	
4	Dolostone: resistant; finely crystalline; light- to dark-grey, weathering light- to dark-grey; mode thick bedded, minimum medium bedded, maximum very thick bedded; light, vuggy, very thick bedded intervals containing *in situ* brachiopods are interbedded with dark, slightly petroliferous skeletal wackestone containing brachiopods, corals, crinoids, and gastropods; basal contact gradational, continuous.	12.5	(41.0)	98.0	
3	Dolostone: moderately resistant; finely crystalline; dark grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; prolific fauna in dark grey, petroliferous, dolomitized skeletal wackestone with abraded brachiopods, gastropods and crinoids; some corals and hemispheroidal stromatoporoids?, some interbeds of thick, light grey, vuggy dolomite; basal contact gradational, continuous.	48.0	(157.5)	85.5	
2	Dolostone: moderately resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant fasciculate, colonial corals in thicker, light grey beds with some solution-collapse breccia; darker grey beds are less fossiliferous; basal contact gradational, continuous.	15.0	(69.2)	37.5	
1	Dolostone: moderately resistant; finely crystalline, featureless; light- to medium-grey, weathering light grey with some pink mottling; smooth, mode thin bedded, minimum very thin bedded, maximum medium bedded; basal contact abrupt at the Tundra Thrust Fault.	22.5	(73.8)	22.5	
	Incomplete thickness of the Root River Formation is 517.0 m (1696.2 ft).				
	Total thickness of the south Tundra 7 Section is 550.0 m (1804.5 ft).				

CADILLAC I SECTION

SECTION 26. This is an east-dipping section that begins at Lat. 61°34'N; Long. 126°44'W (or 6826600N, 407500E in UTM coordinates). It is on the east side of Prairie Creek about 20 km north of Second Canyon on the South Nahanni River in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. The section is best shown in RCAF air photo A17428-088.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Cadillac Formation				
10	Sandstone: moderately recessive; minimum class silt, modal class fine sand, maximum 5 per cent 0.5 mm; medium brown, weathering medium- to light-brownish orange; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; slightly argillaceous and platy; some ripples; some lenticular masses of cream-coloured dolomite breccia as in underlying units along strike from this unit; pronounced zone of mixing with terrigenous material at the base of many of these dolomite breccias; basal contact abrupt.	31.0	(101.7)	178.0	(584.0)
9	Siltstone, sandstone and dolostone (5 per cent exposed, 50 per cent siltstone, 50 per cent dolostone).				
	Siltstone: moderately recessive; modal class silt; brownish yellow, weathering medium brownish yellow; bedding planar and smooth, mode very thin bedded, minimum laminated, maximum very thin bedded; dolomite-cemented, some silty dolomite.				
	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; chaotic breccia with a carbonate mud matrix; dolostone in lower part of unit and siltstone in the upper part.				
	Basal contact gradational, continuous.	33.0	(108.3)	147.0	
8	Limestone: resistant; light to medium-grey, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum thin bedded, maximum nonbedded; mainly chaotic, massive, poorly sorted breccia with a lime mud matrix but a few intervals several metres thick of thin to medium, planar and smooth bedded mudstone; breccia bodies display erosional contacts with bedded intervals; basal contact gradational, continuous.	28.5	(93.5)	114.0	
7	Limestone: resistant; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; chaotic, poorly sorted coarse breccia, slightly crinoidal; basal contact gradational, continuous.	7.5	(24.6)	85.5	
	Limestone (90 per cent - exposed): slightly resistant; medium grey to yellowish grey, weathering yellowish grey to light grey; bedding planar to wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded, yellow, silty calcilutite and grey, crinoidal wackestone beds; yellow, silty dolomite tends to fill depressions on the top of crinoidal beds and is reworked along the erosional bases of crinoidal beds; basal contact gradational, continuous.	39.0	(128.0)	78.0	
5	Limestone: slightly resistant to slightly recessive; argillaceous crinoidal wackestone; medium brownish grey, weathering medium grey to orange; bedding planar and smooth, uniformly thin bedded; recessive, argillaceous, calcilutite beds alternate with crinoidal beds almost rhythmically; basal contact gradational, continuous.	10.5	(34.5)	39.0	
4	Limestone: slightly resistant; argillaceous and silty calcilutite, and calcareous shale; yellowish grey, weathering medium grey to greyish yellow; bedding planar, mode very thin bedded, minimum very thin bedded to laminated, maximum thin bedded; one thin bed of crinoidal wackestone near top of unit displaying basal "flame structure" type load casts; this bed also contains brachiopod fragments of a thin shelled type; basal contact gradational, continuous.	10.5	(34.5)	28.5	
3	Limestone: resistant; wackestone; medium grey, weathering medium grey; bedding planar and wavy bed surfaces, mode thin bedded, minimum thin bedded, maximum thick bedded; silty and argillaceous partings between beds of crinoidal wackestone; many platy, rip-up type, breccia clasts; abundant silicified brachiopods on some bed surfaces; basal contact gradational, continuous. GSC loc. C-057714 (see Appendix 2).	6.0	(19.7)	18.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
2	Calcilutite (60 per cent covered): silty; orange-weathering; platy; interbedded with dark grey, thin crinoidal wackestone beds; spectacular, soft sediment folds involving several metres of sediment; basal contact gradational, continuous.	10.5	(34.4)	12.0	
1	Limestone: slightly recessive and silty; orangish grey, weathering greyish orange; bedding wavy, mode thin bedded; minimum very thin bedded, maximum thin bedded; laminated, silty, orange calcilutite contains a few grey, crinoidal and brachiopodal wackestone interbeds; basal contact gradational, continuous.	1.5	(4.9)	1.5	
	Incomplete thickness of the Cadillac Formation is 178.0 m (584.0 ft).				
	Total thickness of the Cadillac 1 Section is 178.0 m (584.0 ft).				

PRAIRIE CREEK 2 SECTION

SECTION 27. This is an east-northeast-dipping section that begins at Lat. 61°31'N; Long. 124°42'W or (6821200N; 409500E in UTM coordinates) in the Virginia Falls map area (95F). The section is immediately east of Prairie Creek and is about 25 km north of Second Canyon. It is best seen in RCAF air photo A17628-021. Thickensses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Arnica Formation				
17	Dolostone: resistant; finely crystalline; dark brownish grey to dark grey, weathering dark brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; abundant crinoids with some two-holed crinoids (*Gasterocoma biocula?*); fetid bituminous dolomite; basal contact gradational, continuous.	7.5	(24.6)	550.0	(1804.5)
16	Dolostone: resistant; finely to medium crystalline; dark brownish grey, weathering medium- to dark-brown; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; same as Unit 17 but even more bituminous; basal contact gradational, continuous.	33.0	(108.3)	542.5	
15	Dolostone: finely to medium crystalline; light brown, weathering white to very light grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; idiotopic to hypidiotopic dolomite with up to 30 per cent fenestral pinpoint and intercrystalline porosity; a little intercrystalline quartz; basal contact gradational, continuous.	18.0	(59.1)	509.5	
14	Dolostone: resistant; finely crystalline; medium to dark brownish grey, weathering light to dark brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; abundantly crinoidal with some scattered coral horizons; corals commonly leached to form vuggy horizons; basal contact gradational, continuous.	30.0	(98.4)	491.5	
13	Dolostone: resistant; finely crystalline; light- to medium-brownish grey, weathering light brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; large vugs common as moldic porosity after corals; vugs partly cemented with white, coarsely crystalline dolomite; some green malachite-like stain in some vugs; basal contact gradational, continuous.	22.5	(73.8)	461.5	
	Incomplete thickness of the Arnica Formation is 111.0 m (364.2 ft).				
	Sombre Formation				
12	Dolostone (60 per cent exposed): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode nonbedded, minimum thick bedded, maximum nonbedded. Almost all of unit is a grain-supporting dolomite and quartz-cemented rubble breccia; hollow quartz crystals up to 3 cm long; parallel bedding on some bed surfaces of unbrecciated, very light grey dolomite; some quartz crystals appear to be pseudomorphous after another mineral such as gypsum with a possibly swallow-tailed twin.	67.5	(221.5)	439.0	1440.3
11	Dolostone (90 per cent exposed): finely crystalline; light grey, weathering light- to very light-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; some mosaic and rubble breccia (solution-collapse) as in Unit 12; breccia cemented with white, coarsely crystalline dolomite and quartz; basal contact gradational, continuous.	24.0	(78.7)	371.5	
10	Dolostone (90 per cent exposed): finely crystalline; light- to medium-grey, weathering light- to very light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; some severely brecciated beds as in units 11 and 12; some thin beds of nearly white, very finely crystalline dolomite; basal contact gradational, continuous.	34.5	(113.2)	347.5	
9	Dolostone (95 per cent exposed): finely crystalline; light- to medium-grey, weathering light- to very light-grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; cycles of medium grey dolostone grading upwards to light grey dolostone; light grey dolostone tends to be colour laminated; some of unit is brecciated as in units 11 and 12; basal contact gradational, continuous.	29.5	(96.8)	313.0	
8	Dolostone A and dolostone B (90 per cent exposed, 95 per cent dolostone A, 5 per cent dolostone B).				
	Dolostone A: finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; similar to dolomite of Unit 9 but without breccia; several, very porous, vuggy horizons of moldic porosity.				
	Dolostone B: very finely crystalline; very light grey, weathering white; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; crudely laminated, fenestral fabric with many coated, reworked botryoidal grains, and angular platy mudchips of pelletal fenestral fabric; authigenic quartz crystals in some zones parallel to bedding; quartz crystals are hollow.				
	Basal contact gradational, continuous.	30.0	(98.4)	283.5	
7	Dolostone: finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; featureless, but with some breccia zones like those in units 11 and 12; basal contact gradational, continuous.	28.5	(93.5)	253.5	
6	Dolostone (90 per cent exposed): finely to medium crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded; minimum thick bedded, maximum very thick bedded; dolomite as in overlying units with one thick breccia body of mosaic and rubble solution-collapse breccia cemented by dolomite and quartz; basal contact gradational, continuous.	30.0	(98.4)	225.0	
5	Dolostone (90 per cent exposed): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; bedded dolomite as in overlying units but one bed of				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	rubble breccia with a dolomicrite matrix with clasts suspended in matrix; basal contact gradational, continuous.	22.5	(73.8)	195.0	
4	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; cycles of medium grey, vuggy dolomite grade upwards to light grey dololaminite.	63.0	(206.7)	172.5	
3	Dolostone A and dolostone B (90 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; thick medium grey beds grade upwards to light grey, laminated dolomite.				
	Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light yellowish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; silty and argillaceous with differentially weathered, platy laminae; 4 intervals of dolostone B in unit which generally cap cycles of dolostone A; some of the bases of intervals of dolostone B are notably scoured.				
	Basal contact gradational, continuous. This unit may correlate with Unit 12 of the nearby Prairie Creek I Section (Sec. 24). Both of these units mark the upward limit of the yellow, silty intervals in the Sombre Formation.	39.0	(128.0)	109.5	
2	Dolostone A and dolostone B (90 per cent exposed, 95 per cent dolostone A, 5 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, same as dolostone A of Unit 3; a little solution-collapse breccia in some thicker beds; fragments cemented by dolomite and quartz; some open-space-filling coarsely crystalline white dolomite with curved crystal faces; mode thick bedded, minimum medium bedded, maximum very thick bedded.				
	Dolostone B: recessive; finely to very finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum very thin bedded; same as dolostone B of Unit 3.				
	Basal contact gradational, continuous.	33.0	(108.3)	70.5	
1	Dolostone A and dolostone B (80 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light grey, weathering light- to medium-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; same as dolostone A of Unit 3; some beds with abundant, moldic porosity from leached amphiporids.				
	Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum very thin bedded; same as dolostone B of Unit 3 in several 2 m thick intervals.				
	Basal contact gradational, continuous.	37.5	(123.0)	37.5	
	Incomplete thickness of the Sombre Formation is 439.0 m (1440.3 ft).				

PRAIRIE CREEK I SECTION

SECTION 28. This is an east-northeast dipping section that begins at Lat. 61°29'N; Long. 124°40'W (or 6817800N, 411300E in UTM coordinates) in the Virginia Falls map sheet (95F) in the District of Mackenzie, N.W.T. The section is immediately east of Prairie Creek about 20 km due north of Second Canyon on the South Nahanni River. This section may be seen in RCAF air photo A17428-021. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Sombre Formation				
16	Dolostone: resistant; finely to medium crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; many vuggy zones with modic porosity of 20 to 25 per cent; basal contact gradational, continuous.	90.0	(295.3)	654.0	(2145.7)
15	Dolostone (90 per cent exposed): resistant; finely to medium crystalline; light grey, weathering light grey to very light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; some wavy bedding (possibly stromatolitic); some moldic porosity in darker grey beds, and some zones of solution-collapse breccia with mosaic and rubble breccias of the host dolomite cemented by white, coarsely crystalline dolomite and quartz; green stain lines some vugs (possibly malachite); basal contact gradational, continuous.	54.0	(177.2)	564.0	
14	Dolostone (80 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; similar to Unit 15 but solution-collapse breccia occupies much of this unit and accounts for some very thick bedded units; some green stains as in Unit 15; basal contact gradational, continuous.	39.0	(128.0)	510.0	
13	Dolostone A and dolostone B (80 per cent exposed, 95 per cent dolostone A, 5 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; medium grey dolomite grades upward to light grey beds; some slightly vuggy zones and some small bodies of breccia as in Unit 15.				
	Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; forms intervals less than 1 m thick and caps cycles where medium grey dolostone grades upwards to light grey dolostone.				
	Basal contact gradational, continuous. This unit may correlate with Unit 3 of the nearby Prairie Creek 2 Section (Sec. 23). Both of these units mark the upward limit of the yellow silty intervals in the Sombre Formation.	60.0	(196.9)	471.0	
12	Dolostone (50 per cent exposed): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; some stromatactis vug porosity in some darker grey beds; otherwise featureless, grey dolomite; basal contact gradational, continuous.	27.0	(88.6)	411.0	
11	Dolostone (5 per cent exposed): finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; mostly talus; basal contact gradational, continuous.	23.0	(75.7)	384.0	
10	Dolostone (90 per cent exposed): resistant; finely crystalline; light- to medium-grey, weathering light				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; mostly featureless but a few small bodies of quartz and white dolomite-cemented mosaic and rubble solution-collapse breccias; some green stain as in Unit 13; basal contact gradational, continuous.	30.5	(165.7)	361.0	
9	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum very thick bedded; medium grey dolomite grades up to light grey dolomite; some zones of rubble breccia in which angular fragments are suspended in a dolomicrite matrix; fragments are crudely aligned parallel to bedding and are up to 0.5 m long; basal contact gradational, continuous.	16.5	(54.1)	310.5	
8	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; medium grey dolomite grades up to light grey dolomite, medium grey dolomite is vuggy and light grey dolomite is weakly colour laminated; basal contact gradational, continuous.	54.0	(177.2)	294.0	
7	Dolostone A and dolostone B (80 per cent dolostone A, 20 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum very thick bedded; medium grey dolomite grades upward to light grey, well laminated dolomite; some algal mat-type overfolds in laminated dolomite; laminae caused partly by differential weathering of slightly argillaceous seams.				
	Dolostone B: recessive; finely crystalline; medium yellowish grey, weathering light yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; silty and argillaceous, platy, laminated dolomite; tends to cap cycles of medium to light grey dolomite; only 3 or 4 intervals of dolostone B in this unit.				
	Basal contact gradational, continuous.	54.0	(177.2)	240.0	
6	Dolostone A and dolostone B (75 per cent dolostone A, 25 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum very thick bedded; medium uniformly grey beds grade upwards to laminated, light grey beds as in Unit 7.				
	Dolostone B: recessive; very finely crystalline; medium yellowish grey, weathering light yellow grey; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; same as in Unit 7 with intervals from 1.5 to 2.5 m thick, only 5 intervals of dolostone B in this unit.				
	Basal contact gradational, continuous.	42.0	(137.8)	186.0	
5	Same as Unit 3 but slightly more yellowish grey dolomite; basal contact gradational, continuous.	39.0	(128.0)	144.0	
4	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; same as in unit 6.				
	Dolostone B: recessive; finely crystalline; medium- to light-yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; same as in Unit 6.				
	Basal contact gradational, continuous.	30.0	(98.4)	105.0	
	Incomplete thickness of the Sombre Formation is 579.0 m (1899.6 ft).				
	Camsell Formation (*Corridor Member*)				
3	Dolostone (5 per cent exposed): finely crystalline; medium grey to yellowish grey, weathering medium- to light-grey and yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; very poorly exposed, perhaps some amphiporid-like stromatoporoids in grey beds; basal contact gradational, continuous.	9.0	(29.5)	75.0	(246.1)
2	Dolostone (5 per cent exposed): finely crystalline; medium- to light-yellowish grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some wispy, argillaceous seams and some scattered orange staining; basal contact gradational, continuous.	39.0	(128.0)	66.0	
1	Dolostone: finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some amphiporid-like stromatoporoids in stringers parallel to bedding; basal contact gradational, continuous.	27.0	(88.6)	27.0	
	Incomplete thickness of the Corridor Member of the Camsell Formation is 75.0 m (246.1 ft).				
	Total thickness of the Prairie Creek I Section is 654.0 m (2145.7 ft).				

PRAIRIE CREEK 3 SECTION

SECTION 29. This is an east-dippig section that begins at Lat. 61°28'N; Long. 124°37'W (or 6816800N, 413800E in UTM coordinates). It is on the east side of Prairie Creek about 17 km north of Second Canyon of the South Nahanni River in the District of Mackenzie, N.W.T. The section is best seen in RCAF air photo A17440-095. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Arnica Formation				
27	Dolostone: medium to coarsely crystalline; brown- to medium-grey, weathering brown- to medium-grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; entire unit is solution-collapse breccia with rubble breccia at base grading upwards to mosaic and crackle breccia with white dolomite interfragment cement; some coral- and stromatactis-bearing horizons; basal contact abrupt. This unit is part of the Manetoe facies of the Arnica Formation.	15.0	(49.2)	746.0	(2447.5)
26	Dolostone: medium to coarsely crystalline; brown- to medium-grey, weathering medium brown to medium grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; part of unit is stromatactis-bearing but most of unit is brecciated crinoidal dolomite, solution-collapse breccia with white dolomite cement; basal contact gradational, continuous. This unit is part of the Manetoe facies of the Arnica Formation.	12.0	(39.4)	731.0	
25	Dolostone: resistant; medium to coarsely crystalline; brown- to medium-grey, weathering brown- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	bedded; brecciated crinoidal dolomite with interfragment, white dolomite cement; some "zebra rock" striped with white dolomite; basal contact gradational, continuous. This unit is part of the Manetoe facies in the Arnica Formation.	14.0	(45.9)	719.0	
24	Dolostone (100 per cent exposed): resistant; finely to medium crystalline; medium- to dark-brown, weathering medium brown; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; abundantly crinoidal and somewhat bituminous, a little authigenic quartz; basal contact gradational, continuous.	37.5	(123.0)	705.0	
23	Dolostone: resistant; finely to medium crystalline; dark- to medium-brown, weathering medium- to dark-brown; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; very crinoidal and bituminous; basal contact gradational, continuous.	8.0	(26.2)	667.5	
22	Dolostone: resistant; finely to medium crystalline; light- to dark-grey, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; crinoidal; one brecciated interval about 10 m thick near the base of the unit; basal contact gradational, continuous.	49.5	(162.4)	659.5	
21	Dolostone (80 per cent exposed): finely to medium crystalline; medium grey, weathering medium grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; very crinoidal with a few scattered, large, solution cavities filled with dolomite; basal contact gradational, continuous.	51.5	(169.0)	610.0	
20	Dolostone: resistant; finely to medium crystalline; medium grey, weathering light- to medium-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; very crinoidal; basal contact gradational, continuous.	31.5	(103.3)	558.5	
19	Dolostone: resistant; finely to medium crystalline; dark greyish brown to medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; greyish brown biostromal beds containing poorly preserved corals and vugs grade upwards to light grey beds in cycles about 1.5 m thick; light grey beds are faintly laminated and, in some places, contain abundant hollow quartz crystals randomly oriented parallel to bedding; some solution-collapse breccia cemented with white dolomite and quartz; basal contact gradational, continuous.	36.0	(118.1)	527.0	
18	Dolostone: resistant; finely to medium crystalline; dark brownish grey, weathering medium brownish grey to grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; some massive, biostromal, vuggy dolomite with partly leached corals in an otherwise crinoidal sequence; corals silicified with cup coral and colonial corals; basal contact gradational, continuous.	24.0	(78.7)	491.0	
17	Dolostone: resistant; finely to medium crystalline; dark brown to light grey, weathering light grey to dark brown; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; vuggy, dark brown dolomite contains interbeds and streaks of light grey faintly laminated dolomite; basal contact gradational, continuous.	21.0	(68.9)	467.0	
16	Dolostone: resistant; finely to medium crystalline; dark brown to light grey, weathering dark brown to light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; similar to Unit 3; abundant hollow quartz needles are randomly oriented in a plane parallel to bedding; individual needles are up to 6 cm long; light grey dolomite tends to occur as mere streaks; a little fenestral fabric in light grey dolomite; basal contact gradational, continuous.	20.5	(67.3)	446.0	
15	Dolostone and limestone (95 per cent dolostone, 5 per cent limestone).				
	Dolostone: resistant; finely to medium crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; vuggy, dark grey dolomite beds grade upwards to light grey, faintly laminated and rippled dolomite; some of the laminite is dolomitized grainstone; a few ostracodes and foraminifers.				
	Limestone: recessive; skeletal and intraclast grainstone; medium grey, weathering medium- to light-grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; caps some cycles of dark grey and light grey dolomite.				
	Basal contact gradational, continuous.	9.0	(29.5)	425.5	
14	Dolostone (90 per cent exposed): resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; thick, featureless beds grade upwards to thick, laminated beds; some fenestral fabric in laminites; basal contact gradational, continuous.	33.0	(108.3)	416.5	
13	Dolostone (90 per cent exposed): finely to medium crystalline; medium- to dark-greyish brown; bedding planar, mode thick bedded, minimum thick bedded; crinoidal (two-holed crinoids) and bituminous with some solution-collapse breccia (fragments less than 20 cm long); white dolomite and translucent quartz partly fill interfragment porosity; some vugs have a white, central, calcite infill; upper part of unit is unbrecciated; some beds contain moldic porosity after leached biogenic material; basal contact gradational, continuous.	7.5	(24.6)	383.5	
12	Dolostone: resistant; finely crystalline; dark brown, weathering medium brown; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; crinoidal as in Unit 3; bituminous; only a small amount of solution-collapse breccia; basal contact gradational, continuous. GSC loc. C-052927 (see Appendix 2).	30.0	(98.4)	376.0	
11	Dolostone (90 per cent exposed): finely crystalline; dark brown, weathering medium- to dark-brown; bedding planar, mode very thick bedded, minimum medium bedded, maximum very thick bedded; crinoidal (two-holed crinoids); dolomite, slightly bituminous; some solution-collapse breccia with interfragment vugs infilled with white dolomite and quartz; basal contact gradational, continuous.	33.0	(108.3)	346.0	
	Incomplete thickness of Arnica Formation is 433.0 m (1420.6 ft). (This thickness is very nearly a total thickness for the Arnica Formation.)				
	Sombre Formation				
10	Dolostone (50 per cent exposed): finely to medium crystalline; light grey to cream, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum very thick bedded; slightly vuggy, sucrosic dolomite with wavy bed partings; moldic porosity after biogenic material forms the vugs; basal contact gradational, continuous.	24.0	(78.7)	313.0	(1026.9)

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
9	Dolostone: resistant; finely crystalline; medium brownish grey, weathering medium- to light-grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; some mudchip-like, small, grey intraclasts in some beds with abundant, very small, reworked intraclasts, some of which appear to have micritized rims; basal contact gradational, continuous.	30.0	(98.4)	289.0	
8	Dolostone (60 per cent exposed): finely crystalline; medium brownish grey, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum very thick bedded; medium brownish grey beds contain scattered crinoids alternating with light grey laminated beds; some lighter grey beds are dolomitized wackestone and packstone with abundant millimetre-sized intraclasts some of which appear to have micritized rims; small green algal crinoid and ostracode fragments occur in some clasts; there are a few, larger, angular, laminite intraclasts; basal contact gradational, continuous.	30.0	(98.4)	259.0	
7	Dolostone (90 per cent exposed): finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum very thick bedded; featureless, medium grey dolomite alternates with slightly brecciated, laminated, light grey dolomite; small, millimetre-sized fragments of laminite form the breccia; basal contact gradational, continuous.	57.0	(187.0)	229.0	
6	Dolostone: resistant; finely crystalline; light- to very light-grey, weathering light to very light-grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum very thick bedded; thick bedded, featureless light grey intervals alternate with laminated, very light grey intervals; laminated intervals are brecciated in some places; some laminae are pelletal and intraclastic; basal contact gradational, continuous.	37.5	(123.0)	172.0	
5	Dolostone: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum very thick bedded; vuggy dolomite with vugs of moldic porosity; basal contact abrupt.	22.0	(72.2)	134.5	
4	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering medium- to light-grey; bedding planar, mode nonbedded, minimum nonbedded; entire unit is a breccia that is crudely graded with large, angular blocks more than a metre long near the base of the unit; very poorly sorted breccia with fragments from a millimetre to more than a metre long; some clasts are themselves reworked breccia; breccia matrix is dolomicrite; basal contact gradational, continuous.	17.0	(55.8)	112.5	
3	Dolostone: resistant; finely crsytalline; light grey, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; a few thin zones of poorly sorted, dolomicrite, mud-supported rubble breccia of angular fragments, with fragments up to 5-10 cm long; basal contact gradational, continuous.	34.0	(111.6)	95.5	
2	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; thin bedded, laminated dolomite is interbedded with thick beds of featureless dolomite; laminated dolomite is pelletal and intraclastic with a slight pink tint; some small ripples in dolomite laminite; basal contact gradational, continuous.	45.0	(147.6)	61.5	
1	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode thick bedded, minimum thin bedded, maximum thick bedded; similar to Unit 2 but with a 4 m thick zone of breccia in a thick bed at the base of the unit; breccia poorly sorted with angular clasts in a dolomicrite matrix; some thick beds are vuggy with leached, moldic porosity; basal contact gradational, continuous.	16.5	(54.1)	16.5	

Incomplete thickness of Sombre Formation is 313.0 m (1026.9 ft).

Total thickness of the Prairie Creek 3 Section is 746.0 m (2447.5 ft).

HEADLESS SECTION

SECTION 30. This is a west-dipping section that begins at Lat. 61°26'N; Long. 124°40'W (6811600N; 410600E in UTM coordinates), on the east side of the Headless Range near the head of Deadman Valley. The section passes westward across the Headless Range north of Second Canyon of the South Nahanni River and may be seen in RCAF air photo A17440-097. Thicknesses were measured using a Jacob's staff.

Sombre Formation

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
44	Dolostone (20 per cent exposed): resistant; finely crystalline; medium to dark grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; abundantly crinoidal (*Gasterocoma bicaula*?), almost like Arnica Formation but grey rather than brownish grey dolomite; basal contact gradational, continuous.	75.0	(246.1)	1123.5	(3686.0)
43	Dolostone: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; slightly crinoidal; veins lined with dogtooth quartz; basal contact gradational, continuous.	18.0	(59.1)	1048.5	
42	Dolostone: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; most of interval is a dolomite breccia; interfragment porosity is nearly completely infilled with white coarsely crystalline dolomite and quartz; basal contact gradational, continuous.	12.0	(39.4)	1030.5	
41	Dolostone (5 per cent exposed): finely crystalline; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; some of this unit may be thin bedded but exposure on adjacent ridges suggests that it is largely thick bedded; basal contact gradational, continuous.	57.0	(187.0)	1018.5	
40	Dolostone (80 per cent exposed): resistant; finely crystalline; medium- to dark-grey, weathering medium- to dark-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; featureless but slightly fetid dolomite; basal contact gradational, continuous.	51.0	(167.3)	961.5	
39	Dolostone (75 per cent exposed): resistant; finely crystalline; medium grey, weathering light- to medium-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; slightly vuggy dolomite containing biogenic moldic porosity with vugs up to 2 cm across; basal contact gradational, continuous.	22.5	(73.8)	910.5	
38	Dolostone: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; no laminated intervals; basal contact gradational, continuous.	24.0	(78.7)	888.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
37	Dolostone: resistant; finely to very finely crystalline; medium- to light-grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; laminated stromatolitic intervals alternate with thick bedded intervals; some small pockets of breccia with lime mud matrix and white, coarsely crystalline dolomite cement partially infilling porosity between clasts; basal contact gradational, continuous.	25.5	(83.7)	864.0	
36	Dolostone (80 per cent exposed): resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; similar to Unit 35 but no breccia is apparent; basal contact gradational, continuous.	15.0	(49.2)	838.5	
35	Dolostone: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; a few thick intervals of breccia near the base of the unit; large, angular breccia clasts are in a dolomitized lime mud matrix; basal contact gradational, continuous.	37.5	(123.0	823.5	
34	Dolostone (75 per cent exposed): slightly recessive; finely crystalline; medium grey to brownish grey, weathering light grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; laminated dolomite with stromatolitic undulations interbedded with silty, brownish grey dolomite, some lenticular bedding; basal contact gradational, continuous.	1.5	(4.9)	786.0	
33	Dolostone (80 per cent exposed): finely crystalline; medium grey, weathering light grey; bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; resistant thick beds grade upwards to thin beds in several cycles up to 5 m thick; basal contact gradational, continuous.	52.5	(172.2)	784.5	
32	Dolostone (80 per cent exposed): silty; finely to very finely crystalline; yellowish grey, weathering light yellowish grey; bedding planar, mode very thin bedded, minimum very thin bedded, maximum very thin bedded; basal contact abrupt.	6.0	19.7	732.0	
31	Dolostone: finely crystalline; medium grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; cycles of resistant thick beds grading upwards to thinner beds; basal contact gradational, continuous.	46.5	(152.6)	726.0	
30	Dolostone: finely crystalline; medium grey, weathering light grey; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; cycles of resistant medium bedded dolomite overlain by thin bedded and laminated dolomite containing abundant fine quartz silt and mica; basal contact gradational, continuous.	15.0	(49.2)	679.5	
29	Dolostone and sandstone (95 per cent dolostone, 5 per cent sandstone).				
	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; thick breccia interval near top of unit with large, angular, poorly sorted clasts up to several metres long in a dolomitized lime mud matrix.				
	Sandstone: modal class coarse sand, minimum class medium sand, maximum 5 per cent 0.75 mm; light yellowish grey, weathering very light yellowish grey; sorting good; rounding and sphericity fair; matrix less than 20 per cent; quartz more than 90 per cent; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; a few recessive sandstone beds at the base of the unit.				
	Basal contact gradational, continuous.	15.0	(49.2)	664.5	
28	Dolostone and sandstone (85 per cent dolostone, 15 per cent sandstone).				
	Dolostone: finely crystalline; light- to medium-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; resistant, darker grey, unlaminated dolomite grades upwards to laminated, light grey dolomite.				
	Sandstone: modal class medium sand, minimum class medium sand, maximum 5 per cent 0.50 mm; orangish yellow, weathering light orangish grey; sorting good; rounding and sphericity good; matrix less than 20 per cent; a weakly bimodal, pure, quartzarenite with modes at 0.6 mm and 0.15 mm; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; laminated with some low-angle crossbedding; grain size distributor appears weakly biomodal; 5 sandstone intervals interbedded with dolostone.				
	Basal contact gradational, continuous.	15.0	(49.2)	649.5	
	Incomplete thickness of the Sombre Formation is 489.0 m (1604.3 ft).				
	Cornwell Formation *(Corridor Member)*				
27	Dolostone A and dolostone B (60 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: sandy; finely crystalline; medium grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; a sandy dolomite with abundant, well rounded, medium to coarse sand-sized quartz grains scattered throughout.				
	Dolostone B: recessive; silty and very finely crystalline; medium greyish brown, weathering yellowish orange; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; almost a brick-coloured silty dolomite interbedded with dolostone A.				
	Basal contact gradational, continuous.	36.0	(118.1)	634.5	(2081.7)
26	Dolostone A, dolostone B and sandstone (75 per cent dolostone A, 20 per cent dolostone B, 5 per cent sandstone[1]				
	Dolostone A: resistant; finely crystalline; medium grey to yellowish grey, weathering light greyish yellow; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded with other lithologies of the unit, some medium- to dark-brownish grey dolomite beds.				
	Dolostone B: very finely crystalline; greyish yellow, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; silty and argillaceous dolomite; yellow colour due to finely disseminated limonite.				
	Sandstone: modal class coarse sand, minimum class fine sand, maximum 5 per cent 0.80 mm; sorting good; rounding sphericity fair; matrix less than 20 per cent; quartz more than 90 per cent; bedding planar, mode thin bedded, minimum thin bedded, maximum thin bedded; laminated with some very shallow angle crossbeds; laminae interrupted by upward-directed fluid release structures, slightly silicified.				
	Basal contact gradational, continuous.	33.0	(108.3)	598.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
25	Dolostone A and dolostone B (65 per cent dolostone A, 35 per cent dolostone B).				
	Dolostone A: very finely crystalline; yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; planar bedding dominates, but some lenticular beds; forms 5 or 6 interbeds with dolostone B.				
	Dolostone B: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded.				
	Basal contact gradational, continuous.	25.5	(83.6)	565.5	
24	Dolostone A and dolostone B (70 per cent dolostone A, 30 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; interbedded light- and medium-grey weathering limestone.				
	Dolostone B: very finely crystalline; greyish yellow, weathering yellowish grey; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; silty, with argillaceous and limonitic seams, form 4 to 5 interbeds less than one metre thick with dolostone A.				
	Basal contact gradational, continuous.	33.0	(108.3)	540.0	
23	Dolostone A and dolostone B (95 per cent dolostone A, 5 per cent dolostone B).				
	Dolostone A: finely crystalline; medium- to dark-grey, weathering light- to dark-grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; mainly light grey dolostone but some beds of dark grey dolostone; dark dolostone is slightly mottled.				
	Dolostone B: recessive; very finely crystalline; greyish yellow, weathering light yellowish grey to greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; silty, with limonitic and argillaceous parting seams; a poorly developed pelletal fabric; dolostone B is interbedded with dolostone A; only 2 beds of dolostone B in this unit.				
	Basal contact gradational, continuous.	30.0	(98.4)	507.0	
22	Dolostone: resistant; finely crystalline, calcareous; medium- to dark-grey; weathering light- to dark-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; a few beds of fossiliferous dolomitic wackestone with calcispheres; basal contact gradational, continuous.	27.0	(88.6)	477.0	
21	Dolostone A and dolostone B (70 per cent exposed, dolostone A, 90 per cent 10 per cent dolostone B).				
	Dolostone A: finely crystalline; light- to medium-grey, weathering light grey to light yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; some orange-weathering, limonite-bearing, argillaceous seams.				
	Dolostone B: recessive; very finely crystalline; greyish yellow, weathering yellow; bedding planar, mode thin bedded, minimum laminated, maximum thin bedded; argillaceous and silty with limonite, finely laminated and containing poorly-developed mudcracks; several cycles of dolostone A interbedded with dolostone B.				
	Basal contact gradational, continuous.	16.0	(52.5)	450.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
20	Dolostone: resistant; finely crystalline; medium- to dark-grey, weathering light- to dark-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; mainly light grey dolomite with a few (3-4) dark grey beds; dark grey beds have erosional basal contacts with underlying light grey beds with light grey chips near the bases of dark-grey beds. Units 19 and 20 form a local grey marker interval in the middle of the Camsell Formation here; basal contact locally erosional.	18.5	(60.7)	434.5	
19	Dolostone: finely crystalline; medium- to dark-grey, weathering light- to dark- grey; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; mostly medium grey dolostone but a few beds of dark grey dolomite are present; fetid odor to dark grey beds; basal contact gradational, continuous.	16.5	(54.1)	415.5	
18	Dolostone: as in Unit 17, with 6 cycles of yellow, silty dolomite alternating with grey dolomite; basal contact gradational, continuous.	51.0	(167.3)	399.0	
17	Dolostone A and dolostone B (85 per cent dolostone A, 15 per cent dolostone B).				
	Dolostone A: finely crystalline; light- to medium-grey, weathering light grey to light yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; some thin, discontinuous, argillaceous seams stained orange; some fenestral fabric.				
	Dolostone B: very finely crystalline; greyish yellow, weathering yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; some quartz silt and argillaceous material; some poorly developed mudcracks and stromatolites; some lenticular as well as planar bedding; dolostone B is interbedded with intervals of dolostone A in 3 to 4 cycles.				
	Basal contact gradational, continuous.	37.5	(123.0)	348.0	
16	Dolostone A and dolostone B (60 per cent dolostone A, 40 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; very smooth bedding surfaces with some orange-weathering, argillaceous seams.				
	Dolostone B: silty; finely to very finely crystalline; yellowish grey, weathering light greyish yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; finely laminated with argillaceous parting seams; quartz silt content 40 to 90 per cent in some beds; intervals of dolostone B up to 2 m thick are interbedded with intervals of dolostone A that are several metres thick.				
	Basal contact gradational, continuous.	12.0	(39.4)	310.5	
15	Dolostone: very finely to finely crystalline dolomite; medium grey to yellowish grey, weathering light grey to greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; intervals of thinly bedded, yellow, silty dolomite with argillaceous partings are interbedded with medium bedded intervals of grey, featureless, or weakly laminated dolomite; basal contact gradational, continuous.	9.0	(29.5)	298.5	
14	Dolostone A and dolostone B (75 per cent exposed, dolostone A, 90 per cent 10 per cent dolostone B).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Dolostone A and dolostone B: same as in Unit 13; basal contact gradational, continuous.	9.0	(29.5)	289.5	
13	Dolostone A and dolostone B (90 per cent exposed, 90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; lighter grey dolomite tends to be laminated.				
	Dolostone B: argillaceous, finely crystalline; medium- to light-grey, weathering greyish yellow; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; yellow colour is indicative of finely disseminated limonite.				
	Basal contact gradational, continuous.	22.5	(73.8)	280.5	
12	Dolostone: resistant; very finely crystalline; dark- and medium-grey to light grey, weathering medium grey to light yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; dark and medium grey dolomite is interbedded with slightly argillaceous and limonitic, yellowish grey dolomite; intervals of each dolomite type are less than 3 m thick; light coloured dolomite tends to be laminated; basal contact gradational, continuous.	22.5	(73.8)	258.0	
11	Dolostone: resistant; very finely crystalline; medium grey, weathering medium yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; basal contact gradational, continuous.	27.0	(88.6)	235.5	
10	Dolostone: finely crystalline; slightly argillaceous; light grey, weathering light orangish and yellowish grey; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; very planar bedding and thin, limonitic, argillaceous seams weather out in relief; basal contact gradational, continuous.	21.0	(68.9)	208.5	
9	Dolostone and shale (80 per cent dolostone, 20 per cent shale).				
	Dolostone: calcareous and argillaceous; finely crystalline; impurities clay; dark greyish brown, weathering greenish orange; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; dolomite similar to that in Unit 8, some vertical worm burrows in thin beds.				
	Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.02 mm; dark brown, weathering light yellowish or greenish grey; sorting not determined; rounding and sphericity not determined; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; several intervals of shale less than 2 to 3 m thick are interbedded with dolomite in this unit.				
	Basal contact gradational, continuous.	18.0	(59.1)	187.5	
8	Dolostone: recessive; calcareous, very finely crystalline; dark greyish brown, weathering greenish orange; bedding planar, mode thin bedded, minimum laminated, maximum medium bedded; pronounced argillaceous partings between beds; some mudcracks; some lenticularly bedded intervals; abundant argillaceous material in the dolomite; some intervals of dolomitic shale; basal contact abrupt.	12.0	(39.4)	169.5	
	Total thickness of the Corridor Member of the Camsell Formation is 477.0 m (1565.0 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Root River Formation				
7	Dolostone: finely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; dolomite similar to that in Unit 5; basal contact gradational, continuous.	27.0	(88.6)	157.5	
6	Dolostone: finely crystalline; light yellowish grey, weathering light grey to light yellowish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum medium bedded; some discontinuous and lenticular bedding, some faint fenestral fabric; basal contact gradational, continuous.	13.5	(44.3)	130.5	
5	Dolostone: resistant; finely crystalline; medium grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational, continuous.	21.0	(68.9)	117.0	
4	Dolostone (10 per cent exposed): resistant; finely crystalline; light yellowish grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; bed partings contain argillaceous material and limonite; basal contact gradational, continuous.	39.0	(128.0)	96.0	
3	Dolostone: resistant; medium crystalline; almost weathers white; some pinpoint, possibly fenestral vugs filled with sparry dolomite; light grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; basal contact gradational, continuous.	24.0	(78.7)	57.0	
2	Dolostone (10 per cent exposed): dolomite as in Unit 1; light greyish yellow, weathering light yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; basal contact gradational, continuous.	24.0	(78.7)	33.0	
1	Dolostone (60 per cent exposed): resistant; finely to medium crystalline; light greyish yellow, weathering light yellowish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; mainly planar bedded dolomite but some lenticular bedding; some quartz silt and intercrystalline limonite after pyrite; basal contact gradational, continuous.	9.0	(29.5)	9.0	
	Incomplete thickness of the Root River Formation is 157.0 m (515.1 ft).				
	Total thickness of the Headless Section is 1123.5 m (3686.0 ft).				

SECOND CANYON 2 SECTION

SECTION 31. This is a gently southeast-dipping section that extends southward over a hill south of Second Canyon on the South Nahanni River in the Virginia Falls map area in the District of Mackenzie, N.W.T. It begins at Lat. 61°18'N; Long. 126°42'W (or 6797830N, 408700E in UTM coordinates). This section is best seen in RCAF air photo A17660-158.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation				
10	Limestone: moderately recessive; argillaceous and fossiliferous, pelletal wackestone; medium- to dark-grey, weathering light- to medium-grey; bedding nodular but fairly planar, mode medium bedded, minimum thin bedded, maximum medium bedded; abundant, greyish green, argillaceous partings and greenish and orange mottlings; abundant brachiopods, crinoids, gastropods and ostracodes, pelletal; basal contact abrupt. GSC loc. C-053037 (see Appendix 2).	30.0	(98.4)	302.0	(1122.0)
9	Shale (30 per cent exposed): recessive; modal class clay, minimum class clay, maximum 5 per cent,				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	0.02 mm; brown, weathering yellow; bedding planar to wavy, mode laminated, minimum thinly laminated, maximum laminated; argillaceous partings, sparse fossils (brachiopods); this unit is slightly more recessive than the overlying and underlying units; basal contact gradational, continuous.	27.0	(88.6)	312.0	
8	Limestone: moderately recessive; argillaceous and pelletal wackestone; medium grey, weathering medium greenish grey; bedding wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; abundant argillaceous partings and some scattered crinoids; basal contact gradational, continuous.	15.0	(49.2)	285.0	
	Incomplete thickness of the Headless Formation is 72.0 m (236.2 ft).				
	Funeral Formation				
7	Siltstone (90 per cent exposed): slightly recessive; calcareous; modal class silt, minimum class clay, maximum 5 per cent 0.06 mm; medium brown, weathering yellow; sorting fair, matrix more than 20 per cent, quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; platy and argillaceous; some shale; some fissile intervals; several thin beds of grey, argillaceous calcilutite; basal contact gradational, continuous.	21.0	(68.9)	270.0	(885.8)
6	Siltstone (80 per cent exposed): recessive; calcareous and shaly; modal class silt, minimum class clay, maximum 5 per cent 0.06 mm; medium brown, weathering yellow; sorting fair; matrix more than 20 per cent, quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; some intervals fissile, others platy; this and the overlying unit are well exposed on a moderately steep hillside; basal contact gradational, continuous.	30.0	(98.4)	249.0	
5	Siltstone (5 per cent exposed): dolomite cemented; similar to the underlying unit; weathers yellow; basal contact gradational, continuous.	78.0	(255.9)	219.0	
4	Siltstone (5 per cent exposed): dolomite cemented; recessive; shaly and calcareous; modal class silt, minimum class clay, maximum 5 per cent 0.06 mm; brownish grey, weathering greyish yellow; sorting fair; matrix more than 20 per cent, quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; fissile, partly shale and partly siltstone, this and overlying unit are heavily vegetated; basal contact abrupt.	30.0	(98.4)	141.0	
	Total thickness of the Funeral Formation is 199.0 m (521.7 ft).				
	Arnica Formation				
3	Dolostone (60 per cent exposed): moderately resistant; medium crystalline; light grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; some brecciated dolomite infilled with white coarsely crystalline dolomite; basal dolostone is fossiliferous with ramose, colonial corals and crinoids (two-holed crinoids); basal contact gradational, continuous. Part of this unit is Manetoe facies dolomite. GSC loc. C-053031 (see Appendix 2).	15.0	(49.2)	111.0	(364.2)
2	Dolostone (60 per cent exposed): moderately resistant; medium crystalline; dark brownish grey, weathering dark brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; abundant corals and stromatoporoids; some fossiliferous intraclasts; slightly brecciated with white dolomite; this and overlying unit are on a gentle dip slope. Part of this unit is Manetoe facies dolomite. GSC loc. C-053029 (see Appendix 2).	51.0	(167.3)	96.0	
1	Dolostone (40 per cent exposed): moderately resistant; finely crystalline; light grey to brownish grey, weathering light grey to brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; crinoidal, particularly in brownish grey upper part; brecciated with a crackle breccia in a brickwork pattern with white dolomite in the fractures; unit is heavily vegetated; basal contact gradational, continuous.	45.0	(147.6)	45.0	
	Incomplete thickness of the Arnica Formation is 111.0 m (364.2 ft).				
	Total thickness of the Second Canyon 2 Section is 342.0 m (1122.0 ft).				

SECOND CANYON 1 SECTION

SECTION 32. This is a southeast-dipping section that begins at Lat. 61°18'N; Long. 124°39'W (or 6797300N, 411300E in UTM coordinates), in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It extends across the west side of the Headless Range immediately south of Second Canyon on the South Nahanni River and is best seen in RCAF air photo A17440-158. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
33	Limestone: fossiliferous wackestone; light- to medium-grey, weathering light grey; bedding planar, thick to massive bedded; massive coral and stromatoporoids-bearing, crinoidal wackestone; large dark grey to black, irregular areas containing abundant bitumen; top of exposed Nahanni is about 30 m higher; but very poorly exposed; basal contact gradational, continuous.	19.5	(64.0)	1511.5	(4959.0)
32	Limestone: fossiliferous wackestone; light- to dark-grey, weathering light- to dark-grey; bedding wavy, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; similar to wackestone in Unit 33, but even more black bitumen; branching corals are abundant but many are not in place; in some places there are breccia bodies with clasts of the host wackestone suspended in dark, bituminous wackestone; the individual breccia clasts appear to be plastically deformed; basal contact gradational, continuous.	9.0	(29.5)	1492.0	
	Incomplete thickness of the Nahanni Formation is 28.5 m (93.5 ft).				
	Headless Formation (and Funeral Formation?)				
31	Limestone (80 per cent exposed): argillaceous wackestone; medium greenish grey, weathering light to medium greenish grey; bedding nodular, mode thin bedded, minimum thin bedded, maximum medium bedded; knobbly bed surfaces with argillaceous partings; a few scattered articulated brachiopods; some indeterminate skeletal debris; basal contact gradational, continuous.	15.0	(49.2)	1483.0	(4865.5)
30	Limestone (100 per cent exposed): argillaceous, fossiliferous wackestone; dark greenish grey, weathering medium to dark greenish grey; bedding nodular, mode medium bedded, minimum thin bedded, maximum medium bedded; knobbly bed surfaces with argillaceous partings; abundant, articulated, mainly atrypid-type, brachiopods; basal contact gradational, continuous.	18.0	(59.1)	1468.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
29	Limestone: argillaceous, fossiliferous wackestone; dark greenish grey, weathering medium to dark greenish grey: bedding nodular, mode thin bedded, minimum thin bedded, maximum medium bedded; knobbly bed surfaces with green argillaceous partings; brachiopods and some branching corals; a little dolomite; basal contact gradational, continuous. GSC loc. C-052847 (see Appendix 2).	36.0	(118.1)	1450.0	
28	Limestone (80 per cent exposed): argillaceous calcilutite; dark grey, weathering medium- to dark-grey with orange mottles; bedding wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; greenish argillaceous material forms bed partings and orange (limonitic?) argillaceous material occurs in burrows; some indeterminate skeletal material perhaps like Unit 27; basal contact gradational, continuous.	26.0	(85.3)	1414.0	
27	Shale (5 per cent exposed): modal class clay, minimum class clay, maximum 5 per cent 0.02 mm; medium greyish yellow, weathering medium yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; a platy, calcareous and fossiliferous shale, probably some shaly limestone; basal contact abrupt. This unit resembles Funeral Formation shale and may, in fact, be a part or a tongue of the Funeral Formation. GSC loc. C-052844 (see Appendix 2).	25.0	(82.0)	1388.0	
	Total thickness of the Headless Formation is 120.0 m (393.7 ft).				
	Arnica Formation				
26	Dolostone (40 per cent exposed): finely to medium crystalline; medium- to light-grey, weathering light grey; bedding planar, mode nonbedded, minimum very thick bedded, maximum nonbedded; scattered vugs formed from enlarged moldic porosity; basal contact gradational, continuous.	30.0	(98.4)	1363.0	(4471.8)
25	Dolostone: finely to medium crystalline; medium- to light-grey, weathering light grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; very vuggy with vugs formed from enlarged moldic porosity; basal contact gradational, continuous.	14.5	(47.6)	1333.0	
24	Dolostone: finely to medium crystalline; medium grey, weathering medium grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; massive reef rock with large coral heads up to 0.5 m across; some intervals with abundant stromatactis-like cavities infilled with white dolomite and floored with dark carbonate sediment; some zones with abundant, partly leached amphipora; some solution-collapse breccia similar to that in the underlying Arnica Formation; basal contact gradational, continuous. This unit is part of the Manetoe facies dolomite of the Arnica Formation.	9.0	(29.5)	1318.5	
23	Dolostone (30 per cent exposed): finely to medium crystalline; medium grey, weathering medium grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; a dolomitized reef boundstone and wackestone; unfossiliferous, appearing on weathered surface but is abundantly fossiliferous with colonial corals and tabular stromatoporoids, bituminous; a little solution-collapse breccia; basal contact gradational, continuous. This unit contains some Manetoe facies dolomite. GSC loc. C-052840 (see Appendix 2).	42.0	(137.8)	1309.5	
22	Dolostone (50 per cent exposed): finely to medium crystalline; medium- to dark-grey, weathering medium grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; dolomitized reef rock with abundant branching thamnoporid or Coenites-like corals with abundant tabular and hemispheroidal stromatoporoids between the corals, slightly bituminous; basal contact gradational, continuous. This unit contains some white Manetoe facies dolomite.	10.5	(34.5)	1267.5	
21	Dolostone (80 per cent exposed): finely to medium crystalline; medium greyish brown; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; sightly crinoidal and some scattered amphiporid-like corals; basal contact gradational, continuous.	25.0	(82.0)	1257.0	
20	Dolostone: resistant; finely crystalline; medium brownish grey, weathering medium grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; abundant crinoids; basal contact gradational, continuous.	75.0	(246.1)	1232.0	
19	Dolostone (60 per cent exposed): finely crystalline; medium- to dark-grey, weathering medium grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; abundant crinoid ossicles; basal contact gradational, continuous.	75.0	(246.1)	1157.0	
18	Dolostone (30 per cent exposed): finely to medium crystalline; medium- to light-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; some solution-collapse mosaic and rubble breccias with some geopetal fabrics; breccia cemented by coarsely crystalline white dolomite; basal contact gradational, continuous.	36.0	(118.1)	1082.0	
17	Dolostone (50 per cent exposed): finely crystalline; medium- to dark-brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; abundantly crinoidal, bituminous with a fetid odour; basal contact gradational, continuous.	27.0	(88.6)	1046.0	
16	Dolostone (10 per cent exposed): finely crystalline; medium- to dark-brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; scattered crinoids, some bituminous material; basal contact gradational, continuous.	135.0	(442.9)	1019.0	
15	Dolostone (80 per cent exposed): finely crystalline; dark brown, weathering medium to dark brown; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; slightly crinoidal and bituminous; some crackle and mosaic solution-collapse breccia with white dolomite cement near top of unit; basal contact gradational, continuous.	81.0	(265.8)	884.0	
14	Dolostone (5 per cent exposed): finely crystalline; dark brownish grey, weathering medium brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; abundant crinoids, slightly bituminous and fetid; basal contact gradational, continuous.	75.0	(246.1)	803.0	
13	Dolostone: resistant; finely crystalline; medium- to dark-brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; abundant crinoids in pronounced crossbeds with individual troughs 0.5 m across; many broken crinoid ossicles; some white dolomite veining parallel to bedding; basal contact gradational, continuous.	9.0	(29.5)	728.0	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
12	Dolostone (10 per cent exposed): slightly recessive; finely crystalline; medium brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; crinoidal dolomite; a large proportion of solution-collapse rubble and mosaic breccia with white dolomite interfragment cement; angular fragments up to 0.5 m long; basal contact gradational, continuous.	36.0	(118.1)	719.0	
11	Dolostone (90 per cent exposed): finely to medium crystalline; dark greyish brown, weathering medium greyish brown; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; crinoidal dolomite; mainly disarticulated crinoid ossicles but some crinoid stems preserved, many two-holed crinoids, bituminous and fetid; basal contact gradational, continuous. GSC loc. C-052835 (see Appendix 2).	30.0	(98.4)	683.0	
10	Dolostone (10 per cent exposed): finely crystalline; dark brownish grey, weathering dark brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded; dolostone as in overlying units; basal contact gradational, continuous.	108.0	(354.3)	653.0	
9	Dolostone (40 per cent exposed): finely crystalline; dark brown, weathering dark brown; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; slightly crinoidal; crackle and mosaic breccia in a distinctive brickwork pattern of white dolomite veins parallel and perpendicular to bedding; basal contact gradational, continuous.	30.0	(98.4)	545.0	
8	Dolostone: finely crystalline; dark greyish brown, weathering medium- to dark-greyish brown; bedding planar, mode thin bedded, minimum thin bedded, maximum medium bedded; some stromatactis-like cavities infilled with white dolomite; basal contact gradational, continuous.	24.0	(78.7)	515.0	
	Total thickness of the Arnica Formation is 872.0 m (2860.9 ft).				
	Sombre Formation				
7	Dolostone (90 per cent exposed): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; medium grey beds grade upwards to laminated light grey beds, light grey and white colour laminations are common with fenestral fabric; basal contact gradational, continuous.	75.0	(246.1)	491.0	(1610.9)
6	Dolostone (90 per cent exposed): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; same as in Unit 4, calcispheres common in very finely crystalline white dolomite colour laminae; basal contact gradational, continuous.	60.0	(196.9)	416.0	
5	Dolostone (40 per cent exposed): finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode thick bedded, minimum thick bedded, maximum thick bedded, same as in Unit 4; basal contact gradational, continuous.	135.0	(442.0)	356.0	
4	Dolostone: resistant; finely crystalline; medium grey to medium yellowish grey, weathering light grey and yellowish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; medium grey beds grade upwards to light yellowish grey; basal contact gradational, continuous.	6.0	(19.7)	221.0	
	Total thickness of the Sombre Formation is 276.0 m (905.5 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Camsell Formation *(Corridor Member)*				
3	Dolostone (10 per cent exposed): recessive; finely crystalline; medium greyish yellow, weathering light yellow; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; well-laminated with laminae emphasized by differential weathering; slightly silty; basal contact gradational, continuous.	106.0	(361.2)	215.0	(705.4)
2	Dolostone (10 per cent exposed): recessive; finely crystalline; medium yellowish grey, weathering light greyish yellow; bedding planar, mode medium bedded, minimum medium bedded; similar to Unit 3; basal contact gradational, continuous.	81.0	(265.7)	111.0	
1	Dolostone (90 per cent exposed): finely crystalline; medium brownish to yellowish grey, weathering light yellowish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; silty and finely laminated, some algal mat overfolds and teepee structures; basal contact gradational, continuous.	30.0	(98.4)	30.0	
	Incomplete thickness of the Corridor Member of the Camsell Formation is 215.0 m (705.4 ft).				
	Total thickness of the Second Canyon I Section is 1511.5 m (4959.0 ft).				

MEILLEUR RIVER SECTION

SECTION 33. This is a gently east-dipping section on the east side of Meilleur River about 6 km south of Second Canyon on the South Nahanni River in the Virginia Falls map area (95F). It begins at Lat. 61°14'N; Long. 124°40'W and extends eastward. This section was supplied by Banff Oil Ltd. (Sec. RF-32-68). This section contains the previous type section of the Headless Formation (Douglas and Norris, 1960).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
5	Limestone: resistant; skeletal wackestone; medium to dark grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thin bedded dark bituminous and argillaceous intervals alternate with lighter, thicker bedded intervals; brachiopods (*Atrypa*, *Camerotoechia*, *Warrenella*, *Spinatrypa coriacea* and *Schizophoria macfarlani*) and crinoids predominate in the thin bedded intervals whereas thicker beds also contain corals (*Coenites*); slight mottling with ochre-coloured stain; basal contact gradational, continuous.	91.5	(300.2)	336.0	(1095.8)
4	Limestone: resistant; coralline wackestone; medium grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; abundant, lamellar and hemispheroidal stromatoporoids and colonial corals; black chert nodules and silicified corals common in upper part of the unit. This unit is a prominent cliff-former; basal contact gradational, continuous.	46.0	(150.9)	242.5	
3	Limestone: moderately resistant; skeletal wackestone; dark grey, weathering dark to medium grey; bedding planar and irregular, mode thin bedded, minimum thin bedded, maximum medium bedded; argillaceous and bituminous with abundant skeletal debris including brachiopods (*Atrypa*, *Spinulicosta*, *Warrenella*, *Productella*, spiriferids and *Camarotechia*), crinoids, gastropods and some trilobites; basal contact gradational, continuous.	103.5	339.6	196.5	
	Incomplete thickness of the Nahanni Formation is 241.0 m (790.7 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation (and Funeral Formation?)				
2	Limestone (50 per cent exposed): slightly recessive to recessive; argillaceous wackestone; dark grey to greenish grey, weathering medium greenish grey; bedding crudely planar but irregular to nodular, mode thin bedded, minimum very thin bedded, maximum medium bedded; moderately fossiliferous with brachiopods, fish scales, ostracodes, crinoids and bryozoans; abundant, argillaceous, curvilinear partings; basal contact abrupt but the lower half of the unit is not exposed. The Funeral Formation may form part or all of this unexposed interval and may be as much as 30.0 m thick.	65.5	(214.9)	93.0	(305.1)
	Total thickness of the Headless Formation? is 65.5 m (214.9 ft).				
	Arnica Formation				
1	Dolostone: resistant; finely to coarsely crystalline; dark brownish grey to white, weathering dark brownish grey to white; bedding planar and very thick; host rock is dark brownish grey dolomite with abundant crinoids, scattered corals and lamellar stromatoporoids; white Manetoe dolomite cements solution-collapse breccias and has partly replaced the host rock; host rock is very vuggy (reef rock?) in places; basal contact covered.	27.5	(90.2)	27.5	(90.2)
	Incomplete thickness of the Arnica Formation is 27.5 m (90.2 ft).				

SOUTH RAM PLATEAU SECTION

SECTION 34. This is a gently eastward-dipping reconnaissance section on the southwest side of Ram Plateau at Lat. 61°42'N; Long. 124°32'W, near Sundog Creek in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation				
6	Limestone: recessive; argillaceous, slightly fossiliferous wackestone; medium greenish grey, weathering medium greenish grey; bedding irregular and knobby; thin bedded with scattered brachiopods and corals; wavy argillaceous partings.	6.0	(19.7)	130.0	(426.5)
5	Dolostone: moderately recessive; argillaceous, finely to medium crystalline; light brown, weathering light brown; thin, irregular to planar bedding; probably dolomitized Headless limestone. This unit is part of the Manetoe facies dolomite.	9.0	(29.5)	124.0	
	Incomplete thickness of the Headless Formation is 15.0 m (49.2 ft).				
	Landry Formation				
4	Dolostone: moderately resistant; coarsely crystalline; white to light grey with some grey mottling, weathering light grey to white; bedding indistinct but planar, medium- to thick-bedded Manetoe dolomite; calcareous grey patches may be relict Landry; one large cave 2 m high and 5 m broad filled with megacrystalline, pure white dolomite; this cavern has an irregular top and a flat base; basal contact abrupt. This unit is part of the Manetoe facies dolomite.	15.0	(69.2)	115.0	(377.3)
3	Limestone: moderately resistant pelletal packstone; medium grey to brownish grey, weathering medium grey; bedding planar, medium to thick bedded; partly dolomitized and unfossiliferous, a little reddish-ochre staining; basal contact gradational, continuous.	65.0	(213.3)	100.0	
2	Dolostone: moderately resistant; coarsely crystalline; white and light grey, weathering white to light grey; bedding planar but indistinct, thick to medium bedding; some grey patches of only partly dolomitized Landry limestone within the white dolomite, interbedded grey limestone and white dolomite in some places; basal contact abrupt. This unit is part of the Manetoe facies dolomite.	30.0	(98.4)	35.0	
	Total thickness of the Landry Formation is 110.0 m (360.9 ft).				
	Arnica Formation				
1	Dolostone: resistant; medium to finely crystalline; dark brownish grey, weathering medium brownish grey; bedding planar, thick to medium bedded; crinoidal and slightly vuggy.	5.0	(16.4)	5.0	(16.4)
	Incomplete thickness of the Arnica Formation is 5.0 m (16.4 ft).				
	Total thickness of the South Ram Plateau Section is 130.0 m (426.5 ft).				

WEST RAM PLATEAU I SECTION

SECTION 35. This is a nearly horizontal section that extends south-eastward up the northwest side of Ram Plateau in the northeast part of the Virginia Falls map area (95F) in the Northwest Territories. The section begins at Lat. 61°44'25"N; Long. 126°28'W and includes the Funeral Formation and parts of the Arnica and Headless formations. This is the type section of the Funeral Formation.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation				
12	Limestone: resistant; dark grey cliff-former with two very resistant cliffs enclosing a less resistant steep bench; medium bedded, dark grey, crinoidal wackestone with scattered stromatoporoids grading upward to a thicker bedded, bituminous wackestone sequence with large colonial corals (*Favosites*? and *Hexagonaria*?) and stromatoporoids with some pink and ochre staining between beds; this unit underlies the Naharni Formation.	45.0	(147.6)	327.0	(1072.8)
11	Limestone: argillaceous; moderately resistant; brownish grey weathering unit with little solid outcrop; orange mottled, grey, argillaceous, thin, lumpy bedded brachiopodal and crinoidal wackestone.	30.0	(98.4)	282.0	
10	Limestone: recessive; grey weathering bench leading up to the main slope; thin, wavy to lenticular, lumpy bedded, rubbly weathering, grey, crinoidal wackestone with orange argillaceous mottlings.	21.0	(68.9)	252.0	
	Incomplete thickness of the Headless Formation is 96.0 m (315.0 ft).				
	Funeral Formation				
9	Limestone: argillaceous; yellow weathering unit, slightly more resistant than underlying unit; platy, very thin bedded lime mudstone similar to Unit 5.	12.0	(39.4)	231.0	(757.9)
8	Limestone: argillaceous; moderately resistant, dark grey bench of thin bedded, argillaceous, lime wackestone; planar bedded and platy in lower part but grades upward to irregularly thin, lumpy bedded, orange mottled crinoidal wackestone toward the top of the unit (similar to the Headless Formation); many beds have smooth bases but irregular, colour mottled upper surfaces.	28.5	(93.5)	219.0	
7	Limestone: argillaceous; prominent, yellow weathering cliff; very thin, planar bedded, argillaceous lime mudstone similar to Unit 5 but also some more argillaceous, lenticularly bedded intervals.	21.0	(68.9)	190.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
6	Shale: calcareous; limestone: argillaceous; a recessive, yellow, bench-forming unit between cliffs, similar to Unit 4.	13.5	(44.3)	169.5	
5	Limestone: argillaceous; resistant, yellow, prominent cliff-former of very thin bedded, platy, dark grey lime mudstone with yellow argillaceous partings; some pyritized fauna on bedding surfaces.	15.0	(49.2)	156.0	
4	Shale: calcareous; limestone: argillaceous; recessive, yellow weathering bench forming unit; very thin to laminated, lenticular platy bedding in dark grey lime mudstone with yellow argillaceous partings and yellow calcareous shale; orthoconic cephalopods, crinconarids and the brachiopod *Lingula* occur on some bedding surfaces.	22.5	(73.8)	141.0	
3	Limestone: argillaceous; resistant and bright yellow cliff-former; very thin planar, smooth bedded (3 cm thick), yellow weathering, dark grey, lime mudstone with pyrite and a few orthoconic cephalopods (10 cm long) on some bedding surfaces, argillaceous bed partings.	31.5	(103.3)	118.5	
2	Limestone and shale: recessive; yellowish grey weathering vegetated unit (20 per cent exposed) that forms the slope extending up to the overlying cliff-forming unit; platy laminated, lime mudstone with yellow, argillaceous partings; bedding slightly lenticular with discontinuous silty laminae; some pyritized orthoconic cephalopods and small brachiopods on bedding surfaces; very soft, greyish yellow, calcareous shale in vegetated intervals.	84.0	(275.6)	87.0	
	Total thickness of the Funeral Formation is 228.0 m (748.0 ft).				
	Arnica Formation				
1	Dolostone: resistant; dark grey unit with well washed and exposed bedding surfaces in creek bottom; thin to medium, wavy and irregularly bedded, dolostone breccia; particulate rubble floatbreccia (debris flows?) of light coloured, dolomitized, very poorly sorted, subangular, lime mudstone fragments (1.0 mm to 0.5 m) in a dark grey, dolomitized, crinoidal wackestone matrix (two-holed crinoids); dark Arnica dolostone continues in creek below this unit.	3.0	(9.8)	3.0	(9.8)
	Incomplete thickness of the Arnica Formation is 3.0 m (9.8 ft).				
	Total thickness of the West Ram Plateau 1 Section is 327.0 m (1072.8 ft).				

WEST RAM PLATEAU 2 SECTION

SECTION 36. This is a nearly horizontal section that extends southeast up the northwest side of Ram Plateau in the northeast part of the Virginia Falls map area (95F) in the Northwest Territories. The section begins at Lat. 61°44'N; Long. 124°28'W and is 0.5 km southwest of the West Ram Plateau 1 Section. This section includes parts of the Arnica and Headless formations and the Manetoe facies developed in the Arnica and Landry formations. The Manetoe facies in this section has been considered to be correlative with the Funeral Formation immediately northeast (Noble and Ferguson, 1967).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation				
13	Limestone: prominent, brownish grey cliff of black bituminous amphiporid wackestone with scattered colonial corals; medium planar to irregular bedding with orange tinted, argillaceous partings that are wavy; similar cliffs above this unit.	4.5	(14.8)	229.5	(753.0)
12	Limestone: recessive; dark brownish grey weathering unit of thin, lumpy, or nodular bedded, slightly argillaceous, orange mottled, skeletal wackestone containing crinoids and brachiopods; nodular beds outlined by green and orange argillaceous seams.	24.5	(80.4)	225.0	
	Incomplete thickness of the Headless Formation is 29.0 m (95.2 ft).				
	Arnica Formation				
11	Dolostone (breccia): a few more recessive, light grey beds of dolomite-cemented rubble packbreccia similar to Unit 7 but more bedded.	7.5	(24.6)	200.5	(657.8)
10	Dolostone (breccia): a resistant unit similar to the underlying unit but the upper part is predominantly bedded rather than brecciated; dark grey, medium to thick, planar but unevenly bedded, dolomitized, finely crystalline, crinoidal and amphiporid wackestone with small patches of white dolomite-cemented mosaic and rubble packbreccia (some 'zebra rock'); sighting east across valley to base of overlying unit.	10.5	(34.5)	193.0	
9	Dolostone (breccia): resistant; medium grey unit that weathers into hoodoo-like spires; entire unit appears to be white dolomite-cemented rubble and mosaic packbreccia formed of subangular clasts of dark grey, dolomitized, crinoidal wackestone.	30.0	(98.4)	182.5	
8	Dolostone: resistant; medium grey unit that is slightly less resistant and darker grey than the underlying unit; medium to thick, unevenly but planar bedded, dark grey, dolomitized, crinoidal wackestone and packstone; some crackle breccia but unit is almost unbrecciated.	7.5	(24.6)	152.5	
7	Dolostone (breccia): resistant; light grey weathering; entire unit appears to be rubble packbreccia cemented by white dolomite and calcite; large quartz crystals line some vugs; subangular to subrounded fragments of dolomitized, crinoidal wackestone.	37.5	(123.0)	145.0	
6	Dolostone: resistant; light grey, cliff-former like Unit 4; dolomitized, crinoidal wackestone with crinoid fragments up to 1 cm across; some coarsely fragmental, white dolomite-cemented, rubble packbreccia with some calcite and quartz in the larger interfragment vugs; the unit ends at the southern apex of a re-entrant of Funeral Formation shale in the Manetoe facies.	10.0	(32.8)	107.5	
5	Dolostone: recessive; medium grey unit of thick, planar- to lenticular-bedded, dolomitized, coarsely crystalline, crinoidal wackestone; very little coarse breccia but unit appears to have been finely brecciated with abundant, coarsely crystalline, white dolomite.	12.0	(39.4)	97.5	
4	Dolostone: very resistant; light grey, cliff-former of thick- to very thick-bedded, light grey dolomitized, medium to coarsely crystalline, crinoidal wackestone and packstone; some sigmoidal bedding with offlap northwards; one colonial coral observed and some depositional slump breccias were observed where fragments of thin, solitary dark dolostone beds occur in the light grey dolostone; pockets several metres broad of white dolomite-cemented mosaic and rubble packbreccia occur in the light grey dolostone; some unoccluded, interfragment spaces filled with white dolomite and calcite.	18.0	(59.1)	85.5	
3	Dolostone: very resistant; massive, prominent, medium grey cliff in which light grey intervals several metres thick alternate with thin dark grey intervals 0.5 m thick; medium bedded, dolomitized, medium crystalline, crinoidal wackestone and packstone form the light grey beds and dark grey bituminous (fetid), unfossiliferous, finely crystalline dolostone with thin, discontinuous, wavy bedding				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	forms the more recessive dark intervals; pockets several metres broad of angular, white dolomite-cemented crackle and mosaic packbreccia occur in the dark dolostone; 5 dark to light grey cycles in this unit.	18.0	(59.1)	67.5	
2	Dolostone: similar to underlying unit but lighter grey and slightly coarser crystalline; unit extends up a slope to a bench; this unit marks the top of the Arnica Formation as mapped by Douglas and Norris (1974).	25.5	(83.7)	49.5	
1	Dolostone: moderately resistant; medium grey unit that leads up the nose of a slope to a bench, 40 per cent outcrop; medium to thick, planar- to wavy-bedded; medium grey, dolomitized, medium crystalline crinoidal packstone (encrinite) with some two-holed crinoids and crinoids up to 0.5 cm across; 2 m of good outcrop at base and top of unit and broken outcrop in between.	24.0	(78.7)	24.0	
	Incomplete thickness of the Arnica Formation is 200.5 m (657.8 ft).				
	Total thickness of the Manetoe facies is 151.5 m (497.0 ft).				
	Total thickness of the West Ram Plateau 2 Section is 229.5 m (753.0 ft).				

RAM RIVER 2 SECTION

SECTION 37. This is a horizontal section on the west side of Ram Plateau in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It begins at Lat. 61°46'15"N; Long. 124°27'35"W. This section and accompanying paleontological identifications were supplied by Banff Oil Ltd. (Sec. RF-18-67).

Nahanni Formation

6	Limestone: resistant; fossiliferous wackestone; medium grey, weathering medium grey; bedding planar to irregular, mode thin bedded, minimum thin bedded, maximum medium bedded; solitary cup corals common with some colonial corals; basal contact gradational, continuous.	17.0	(55.8)	358.0	(1174.5)
5	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, maximum thin bedded, maximum medium bedded; abundant solitary and colonial corals (e.g. *Favosites, diganophyllid, spongophyllid* and *Billingsastraea*), some brachiopods (*Desquamatia aperanta, Spinulicosta stainbrooki*) and crinoids; some thicker beds are burrow mottled and partly dolomitized; basal contact gradational, continuous.	21.0	(68.9)	341.0	
	Incomplete thickness of the Nahanni Formation is 38.0 m (124.7 ft).				

Headless Formation

4	Limestone (50 per cent exposed): moderately recessive and argillaceous; medium grey to greenish grey, weathering medium greenish grey; bedding planar and irregular, thin- to medium-bedded; abundant, bioclastic material including corals (*Billingsastraea, digonophyllid, Favosites*, and *Sociophyllum*), gastropods, crinoids, brachiopods (*Atrypa, Spinatrypa corlacea, Spinulicosta stainbrooki, Emanuella* and *Pletospirifer compactus*, and bryozoans; abundant, curving, argillaceous seams; basal contact gradational, continuous.	24.5	(80.4)	320.0	
3	Limestone (50 per cent exposed): recessive and argillaceous; dark grey to black, weathering dark grey; bedding planar to irregular, uniformly thin bedded, rubbly with abundant, argillaceous partings; slightly nodular and bituminous; moderately fossiliferous with brachiopods (*Atrypa, Eoschuchertella adocoeta, Productella, Emanuella*, and strophedontids), trilobites (*Dechenella*), ostracodes, crinoids and gastropods; basal contact covered.	47.0	(154.2)	295.5	
	Total thickness of the Headless Formation is 71.5 m (234.6 ft).				

Funeral Formation

2	Shale (70 per cent exposed): recessive and calcareous; dark- to medium-greyish brown, weathering light brown; bedding planar and smooth, mode laminated, minimum laminated, maximum very thin bedded; occasional thin to medium fossiliferous limestone beds that contain abundant brachiopods (*Desquamatia aperanta, Spinatrypa corlacea, Spinulicosta stainbrooki, Schizophoria, Eoschuchertella adocoeta, Emanuella, Warrenella lirki*, and others), some corals (*Alveolites*), crinoids, trilobites, gastropods and pelecypods; brown to rusty weathering due in part to disseminated, syngenetic pyrite; the very thin bedded intervals are argillaceous calcilutite rather than shale; basal contact covered.	154.0	(505.2)	248.5	
	Total thickness of the Funeral Formation is 154.0 (505.2 ft).				

Arnica Formation

1	Dolostone: resistant; finely crystalline; dark brownish grey, weathering medium to dark brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; thicker beds contain scattered corals and vugs, scattered black chert blebs and thin chert bands (3 cm thick) near the top of the unit; scattered patches of solution-collapse breccia cemented with white dolomite; some replacement of breccia fragments by white dolomite (part of the Manetoe facies).	94.5	(310.0)	94.5	(310.0)
	Incomplete thickness of the Arnica Formation is 94.5 m (310.0 ft).				
	Total thickness of the Ram River 2 Section is 358.0 m (1174.5 ft).				

SUNDOG CREEK SECTION

SECTION 38. This is a horizontal to gently eastward-dipping section that begins at Lat. 61°40'N; Long. 124°27'W (or 6837500N, 422100E in UTM coordinates). This section follows part of the north side of the headwaters of Sundog Creek in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It is best seen in RCAF air photo A17440-035. Thicknesses were measured using a Jacob's staff.

Nahanni Formation

21	Limestone (90 per cent exposed): fossiliferous wackestone; pellets; dark grey, weathering medium- to dark-grey; bedding nodular, mode thin bedded, minimum thin bedded, maximum medium bedded; pelletal, slightly bituminous with some scatter silicified corals and stromatoporoids; basal contact gradational, continuous.	9.0	(29.5)	474.5	(1556.8)
20	Limestone (75 per cent exposed): fossiliferous wackestone; dark grey, weathering medium- to dark-grey; bedding nodular, mode thin bedded, minimum thin bedded, maximum medium bedded; pelletal, slightly bituminous, abundant silicified corals on nodular beds; amphiporids and tabular and hemispheroidal stromatoporoids are abundant; basal contact gradational, continuous.	33.0	(108.3)	465.5	
	Incomplete thickness of the Nahanni Formation is 42.0 m (137.8 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Headless Formation				
19	Limestone (5 per cent exposed): recessive; argillaceous and pelletal calcilutite; medium greyish brown, weathering yellow; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; some lumpy bedded intervals, almost a shale; basal contact gradational, continuous.	15.0	(49.2)	432.5	
18	Limestone: resistant; argillaceous and pelletal wackestone; dark brown, weathering dark grey; bedding nodular, mode thick bedded, minimum medium bedded, maximum thick bedded; bioturbated with abundant, fine fossil debris; dark brown, sooty, argillaceous material; basal contact gradational, continuous.	5.5	(18.0)	417.5	
17	Limestone (100 per cent covered): vegetated with a few small outcroppings of shaly limestone like that in Unit 16; basal contact gradational, continuous.	12.0	(39.4)	412.0	
16	Limestone: argillaceous wackestone; dark brown, weathering dark brown; some silicified corals and brachiopods; some chert nodules in float, mode medium bedded, minimum thin bedded, maximum medium bedded. GSC loc. C-052905 (see Appendix 2).	22.5	(73.8)	400.0	
15	Dolostone (20 per cent exposed): medium to coarsely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; solution-collapse breccia throughout with white dolomite-cement between angular clasts; some 'zebra rock' in which white dolomite forms stripes with the darker host dolostone; some beds with abundant amphiporid-like corals; basal contact abrupt. This unit is part of the Manetoe facies in the Headless Formation.	27.0	(88.6)	377.5	
	Total thickness of the Headless Formation is 82.0 m (269.0 ft).				
	Landry Formation				
14	Limestone: resistant; pelletal calcilutite; medium brown, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum nonbedded; some calcispheres and ostracodes, thinner bedded intervals are slightly bituminous and recessive; basal contact gradational, continuous.	25.5	(83.7)	350.5	(1149.9)
13	Limestone (100 per cent exposed): very resistant; pelletal packstone and grainstone; medium brown, weathering medium grey; bedding planar, mode very thick bedded, minimum medium bedded, maximum nonbedded; same as limestone in Unit 12; some tidal? channel deposits about 10 m broad, filled with rippled, pelletal and intraclast wackestone; basal contact gradational, continuous.	22.5	(73.8)	325.0	
12	Limestone: resistant; pelletal wackestone with a little fenestral fabric; medium brown, weathering light- to medium-grey; bedding planar, mode nonbedded, minimum medium bedded, maximum nonbedded; some calcispheres and ostracodes, some recessive thinner bedded bituminous intervals same as Unit 14.	31.0	(101.7)	302.5	
	Total thickness of the Landry Formation is 79.0 m (259.2 ft).				
	Arnica Formation				
11	Dolostone: medium to coarsely crystalline; light brown to white, weathering light grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; grey mottles in white dolomite mark the position of collapsed clasts of the host rock dolomite; some bitumen and limonite occurs between the crystals in the grey areas where the original dolomite has been replaced; some quartz occurs at the centre of the vugs; basal contact gradational, continuous. This unit is part of the Manetoe facies in the Arnica Formation.	16.5	(54.1)	271.5	(890.7)
10	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: medium crystalline; light- to dark-grey, weathering light grey; bedding planar, mode nonbedded, minimum very thick bedded, maximum nonbedded; dark, finely crystalline dolomite is interpenetrated by medium crystalline, light grey to white dolomite imparting a mottled appearance to the rock.				
	Dolostone B: recessive; finely to medium crystalline; medium brownish grey, weathering light brownish grey; bedding planar, mode thin bedded, minimum very thin bedded, maximum thin bedded; a little pinkish orange stain with some seams of slightly bituminous, argillaceous material and dolomite; forms intervals less than 2 m thick between thick intervals of dolostone A; abundantly crinoidal, almost a dolomitized crinoid grainstone with individual, light grey, crinoid flows separated by dark dolomicrite.				
	Basal contact gradational, continuous.	25.5	(83.7)	255.0	
9	Dolostone (90 per cent exposed): finely to coarsely crystalline; light- to dark-grey, weathering light grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; dark grey to brownish grey crinoidal dolomite is interpenetrated by medium to coarsely crystalline light grey to white dolomite; basal contact gradational, continuous.	34.5	(113.2)	229.5	
8	Dolostone: finely to coarsely crystalline; light- to dark-brownish grey, weathering light brownish grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; slightly crinoidal, dolomitized wackestone; some zones of solution-collapse breccia with large, angular fragments cemented by coarsely crystalline, white dolomite; green stain lines, some partly filled vugs (possible malachite); basal contact gradational, continuous.	34.5	(113.2)	195.0	
7	Dolostone: finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode nonbedded, minimum very thick bedded, maximum nonbedded; moderately crinoidal dolomite, a dolomitized crinoid wackestone with disaggregated crinoid ossicles; basal contact gradational, continuous.	15.0	(49.2)	160.5	
6	Dolostone (10 per cent exposed): recessive; finely crystalline; medium greyish brown, weathering medium greyish brown; bedding planar, mode nonbedded, minimum very thick bedded, maximum nonbedded; very friable, crinoidal dolomite, fetid and bituminous; basal contact gradational, continuous.	10.5	(34.5)	145.5	
5	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light- to medium-grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; very crinoidal, resistant dolomite beds alternate with less crinoidal, darker grey, more recessive beds; more crinoidal beds may be mound phases; basal contact gradational, continuous.	39.0	(128.0)	135.0	
4	Dolostone: resistant; finely crystalline; light grey to medium brownish grey, weathering light grey to medium				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	brownish grey; bedding planar, mode nonbedded, minimum nonbedded, maximum nonbedded; massive beds of resistant, light grey, very crinoidal dolomite alternate with intervals of more recessive, medium brownish grey, slightly bituminous, moderately crinoidal dolomite; more crinoidal dolomite may be mound phase whereas less crinoidal may be offmound; basal contact gradational, continuous. GSC loc. C-052888 (see Appendix 2).	21.0	(68.9)	96.0	
3	Dolostone (90 per cent exposed): recessive; finely crystalline; medium brownish grey, weathering medium brownish grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; mainly unfossiliferous but some lenses of crinoids; a few moderately crinoidal intervals, bituminous and friable; basal contact gradational, continuous.	15.0	(49.2)	75.0	
2	Dolostone (60 per cent exposed): resistant; finely crystalline; light- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; very crinoidal dolomite (mound phase); many "two-holed" crinoid ossicles; some vug-fillings of white, coarsely crystalline calcite; basal contact gradational, continuous.	28.5	(93.5)	60.0	
1	Dolostone (90 per cent exposed): finely to coarsely crystalline; medium- to dark-brown, weathering medium brown; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; lighter dolomite is crinoidal and darker dolomite is vuggy with moldic porosity after leached corals; basal contact gradational, continuous.	31.5	(103.3)	31.5	(103.3)
	Incomplete thickness of the Arnica Formation is 271.5 m (890.7 ft).				
	Total thickness of the Sundog Creek Section is 474.5 m (1556.3 ft).				

RAM PLATEAU I SECTION

SECTION 39. This is a nearly horizontal, slightly west-dipping section that begins at Lat. 61°45'N; Long. 124°25'W (or 6867200N; 425000E in UTM coordinates). It is on the west side of a north flowing creek at the north end of Ram Plateau in the northeast part of the Virginia Falls map area (95F). The section is best seen in RCAF air photo A17441-92. Thicknesses were measured using a Jacob's staff.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Fort Simpson Formation				
21	Siltstone (5 per cent exposed): modal class silt, minimum class silt, maximum 5 per cent 0.06 mm; colour brown, weathering yellowish orange; sorting not determined, rounding and sphericity not determined; less feldspar than lithic clasts; bedding planar, mode laminated, minimum laminated, maximum laminated; a dolomite-cemented siltstone; basal contact abrupt.	0.1	(0.3)	801.1	(2628.3)
	Incomplete thickness of the Fort Simpson Formation is 0.1 m (0.3 ft).				
	Nahanni Formation				
20	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; beds containing abundant amphiporids and thamnoporid-like corals alternate with relatively unfossiliferous beds; slightly argillaceous, slightly bituminous; basal contact gradational, continuous.	30.0	(98.4)	801.0	(2628.0)
19	Limestone (90 per cent) and shale (10 per cent): similar to Unit 4; slightly silicified, fossiliferous wackestone with crinoids, bryozoans and brachiopods; basal contact gradational, continuous.	72.0	(236.2)	771.0	
18	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; silicified amphiporids abundant, some crinoids and brachiopods, slightly bituminous; basal contact gradational, continuous.	30.0	(98.4)	699.0	
17	Limestone: resistant; fossiliferous wackestone and boundstone; medium- to dark-grey, weathering medium- to light-grey; bedding planar, mode medium bedded, maximum thick bedded; abundant, colonial corals with some definite biostromes several metres thick; fetid and bituminous; scattered stromatoporoids; basal contact gradational, continuous.	30.0	(98.4)	669.0	
16	Limestone: resistant; fossiliferous wackestone and boundstone; bedding wavy, mode medium bedded, minimum medium bedded, maximum thick bedded; abundant, silicified corals and stromatoporoids in fetid, bituminous wackestone; basal contact gradational, continuous. GSC loc. C-052969 (see Appendix 2).	24.0	(78.8)	639.0	
15	Limestone (90 per cent exposed): slightly recessive, fossiliferous wackestone; medium grey; bedding crinkly, mode thick bedded, minimum medium bedded, maximum thick bedded; widely scattered, massive colonial corals; lower part of unit is argillaceous and fossiliferous wackestone as is underlying the Headless Formation; basal contact gradational, continuous.	48.0	(157.5)	615.0	
	Total thickness of the Nahanni Formation is 234.0 m (767.7 ft).				
	Headless Formation				
14	Limestone (10 per cent exposed): slightly argillaceous and fossiliferous wackestone; dark grey to greenish grey, weathering medium- to dark-grey, and greenish grey; bedding nodular, mode thin bedded, minimum thin bedded, maximum medium bedded; brachiopods scattered throughout and other skeletal debris; green, curvilinear, argillaceous seams, horn corals, *Coenites*; basal contact abrupt.	52.5	(172.2)	567.0	(1860.2)
13	Shale (50 per cent exposed): recessive; modal class clay, minimum class clay, maximum 5 per cent 0.02 mm; medium grey, weathering yellow; sorting not determined; rounding and sphericity not determined; matrix more than 2 per cent; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; platy, very calcareous shale, almost an argillaceous limestone; similar to limestone and shale of the Funeral Formation; basal contact abrupt.	72.0	(236.2)	514.5	
12	Limestone (10 per cent exposed): recessive; argillaceous wackestone; medium- to dark-grey and greenish grey, weathering medium- to dark-grey and greenish grey; bedding nodular, mode thin bedded, minimum very thin bedded, maximum thin bedded; fossiliferous with brachiopods, pelecypods and echinoderm fragments and an indeterminate skeletal hash; with some charophytes; some fossils appear to be silicified, some skeletal grainstone stringers with fragments cemented by iron-rich calcite; greenish wisps of argillaceous material are common; basal contact gradational, continuous. GSC loc. C-052967 (see Appendix 2).	27.0	(88.6)	442.5	
11	Limestone (5 per cent exposed): similar to Unit 10; basal contact gradational, continuous.	40.5	(132.9)	415.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
10	Limestone (10 per cent exposed): recessive; argillaceous wackestone; pellets; medium- to dark-grey and greenish grey, weathering medium grey, greenish grey and orange; bedding wavy, mode thin bedded, minimum thin bedded, maximum medium bedded; curvilinear green, argillaceous seams weather orange; scattered brachiopods; basal contact gradational, continuous.	21.0	(68.9)	375.0	
	Total thickness of the Headless Formation is 213.0 m (698.8 ft).				
	Funeral Formation				
9	Limestone (15 per cent exposed): similar to Unit 8; basal contact gradational, continuous.	105.0	(344.5)	354.0	(1161.4)
8	Limestone and shale (90 per cent limestone, 10 per cent shale).				
	Limestone: resistant; argillaceous, calcilutite; dark grey, weathering medium yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; thin beds are less yellow weathering than very thin beds, abrupt sapropel.				
	Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; medium- to dark-grey, weathering medium yellow; sorting good; rounding and sphericity angular; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; platy weathering and calcareous, crude cycles of thin bedded limestone grading upwards to platy shale, sapropelic.				
	Basal contact gradational, continuous.	54.0	(177.2)	249.0	
7	Limestone: argillaceous calcilutite; medium- to dark-grey, weathering medium greyish yellow to yellowish orange; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; argillaceous material concentrated along partings, some disseminated pyrite and sapropel; basal contact gradational, continuous.	18.0	(59.1)	195.0	
6	Limestone and shale (90 per cent limestone, 10 per cent shale).				
	Limestone: argillaceous calcilutite; medium- to dark-grey, weathering yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; argillaceous material concentrated along bed partings, some disseminated pyrite and sapropel.				
	Shale: modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; medium brownish grey, weathering medium- to light-yellow; sorting good; rounding and sphericity angular; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; a calcareous shale with argillaceous material concentrated along partings; shale and limestone interbedded in intervals less than 1 m thick.				
	Basal contact gradational, continuous.	31.5	(103.3)	177.0	
5	Shale and limestone (50 per cent shale, 50 per cent limestone).				
	Shale: recessive; modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; dark grey, weathering medium- to light-yellow; sorting not determined; rounding and sphericity angular; matrix more than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; a calcareous shale with argillaceous material concentrated along partings, sapropelic.				
	Limestone: resistant; argillaceous calcilutite; dark grey, weathering yellow; bedding planar, mode very thin bedded, minimum very thin bedded, maximum thin bedded; interbedded with calcareous shale in interbeds less than 1 m thick; some disseminated pyrite and sapropel.				
	Basal contact gradational, continuous.	28.5	(93.5)	145.5	
4	Shale and limestone (70 per cent shale, 30 per cent limestone).				
	Shale: slightly recessive; modal class clay, minimum class clay, maximum 5 per cent 0.01 mm; medium yellowish grey to grey, weathering yellow; sorting good; rounding and sphericity angular; matrix more than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; sapropelic with abundant pyrite; argillaceous parting seams, some current lineations (azimuth 135°; plunge 0°).				
	Limestone: argillaceous calcilutite; dark- to medium-grey, weathering yellow; bedding planar, mode laminated, minimum laminated, maximum very thin bedded; sapropelic with some quartz silt; argillaceous partings; occur as thin intervals in a shale dominated unit.				
	Basal contact gradational, continuous.	30.0	(98.4)	117.0	
3	Shale and limestone (60 per cent shale, 40 per cent limestone).				
	Shale: slightly recessive; modal class clay, minimum class clay, maximum 5 per cent clast size 0.02 mm; medium- to dark-grey, weathering yellow; rounding and sphericity angular; matrix less than 20 per cent; quartz less than 90 per cent; bedding planar, mode laminated, minimum thinly laminated, maximum laminated; sapropelic and pyritic; some pyritized fish fragments; some vague current lineations on bed surfaces; abundant, detrital, quartz silt.				
	Limestone: argillaceous, calcilutite; medium- to dark-grey, weathering yellow; bedding planar, mode very thin bedded, minimum laminated, maximum very thin bedded; some small, dark grey, chert nodules; somewhat sapropelic and pyritic; thin intervals less than 2 m thick interbedded with limestone.				
	Basal contact gradational, continuous.	30.0	(98.4)	87.0	
2	Limestone (80 per cent exposed): argillaceous calcilutite; dark grey, weathering medium yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; shaly bed partings; syngenetic pyrite; outline small-scale contortions in millimetre-thick laminae; up to 20 per cent detrital quartz silt; basal contact gradational, continuous.	30.0	(98.4)	57.0	
1	Limestone (80 per cent exposed): argillaceous calcilutite; dark grey, weathering yellow; bedding planar, mode very thin bedded, minimum laminated, maximum thin bedded; sapropelic and pyritic; abundant quartz silt; basal contact gradational, continuous.	27.0	(88.6)	27.0	(88.6)
	Incomplete thickness of the Funeral Formation is 354.6 m (1163.4 ft).				
	Total thickness of the Ram Plateau I Section is 801.1 m (2628.3 ft).				

FIRST CANYON SECTION

SECTION 60. This is a nearly horizontal section with a slight southward dip. It begins at Lat. 61°17'N; Long. 126°14'W (or 6794200N, 634300E in UTM coordinates) in First Canyon along the South Nahanni River in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. This section is best observed in RCAF air photo A17440-163. This includes the type section of the Arnica Formation (Douglas and Norris, 1961).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
28	Limestone (90 per cent exposed): resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium- to dark-grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; abundant, colonial corals and other skeletal debris; some beds are mottled light and dark grey, basal contact gradational, continuous.	24.0	(78.7)	837.5	(2747.7)
	Incomplete thickness of the Nahanni Formation is 24.0 m (78.7 ft).				
	Headless Formation				
27	Limestone: resistant; argillaceous wackestone; dark- to medium-grey, weathering dark- to medium-grey with ochre-coloured, argillaceous patches on bedding surfaces; bedding planar, mode thick bedded; minimum thick bedded, maximum very thick bedded; slightly mottled, abundant skeletal material; basal contact gradational, continuous.	30.0	(98.7)	813.5	(2669.0)
	Total thickness of the Headless Formation is 30.0 m (98.4 ft).				
	Landry Formation				
26	Limestone and dolostone (50 per cent limestone, 50 per cent dolostone).				
	Limestone: resistant; pelletal wackestone; medium brownish grey, weathering medium- to light-grey; bedding planar and very smooth, mode thick bedded, minimum thin bedded, maximum very thick bedded; very little skeletal material, perhaps a few ostracodes and gastropods.				
	Dolostone: moderately resistant; coarsely crystalline; white, weathering light grey to white; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; dolostone occurs intimately interbedded with limestone and is a replacement of Landry limestone; this dolomite is part of the Manetoe facies.				
	Basal contact abrupt.	54.0	(177.2)	783.5	(2570.5)
	Total thickness of the Landry Formation is 54.0 m (177.2 ft).				
	Arnica Formation				
25	Dolostone: resistant; medium to coarsely crystalline; dark grey, weathering dark- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; (1-15 m thick) massive and vuggy with abundant stromatactis-like pores filled with coarsely crystalline white dolomite (Manetoe facies); dark grey host dolostone is fetid; some cavernous solution vugs filled with white dolomite; some "zebra" texture near top of unit where white dolomite has invaded along bedding planes, chunks of this dark reef rock may have fallen into caverns in the underlying unit that were later infilled and cemented with white dolomite; basal contact gradational. This unit is part of the Manetoe facies dolomite.	19.0	(62.3)	729.5	(2393.4)
24	Dolostone (100 per cent exposed): resistant; coarsely crystalline; white, weathering light grey to white; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; entire unit is a cavern fill of coarsely crystalline white dolomite (Manetoe facies); a weakly crossbedded, light orange-weathering zone of detrital dolomite silt and sand occurs at the erosional base of the cavern fill; some blocks of dark grey reef rock have fallen to the base of the cavern from the overlying unit; this unit crosses a saddle and is correlative with the white dolomite of a nearby butte; some malachite nodules occur within the white cave-filling dolomite; basal contact erosional. This unit is part of the Manetoe facies dolomite.	12.0	(39.4)	710.5	
23	Dolostone: resistant; medium crystalline; dark grey, weathering dark- to medium-grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; stromatactis-bearing fetid dolomite as in underlying units; basal contact gradational, continuous.	15.0	(49.2)	698.5	
22	Dolostone: resistant; medium crystalline; medium grey to brownish grey, weathering medium brownish grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; several beds containing abundant stromatactis; several beds with abundant amphiporids and brachiopods; some zones of leached fossil material have undergone solution-collapse; basal contact gradational, continuous.	27.0	(88.6)	683.5	
21	Dolostone: resistant; finely crystalline; light- to medium-grey, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; some good stromatactis fabric, some with geopetal fabrics; some zones of solution-collapse breccia; basal contact gradational, continuous.	15.0	(49.2)	656.5	
20	Dolostone (80 per cent exposed): moderately resistant; finely crystalline; light- to medium-brownish grey, weathering light brownish grey; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; thicker medium brownish grey beds alternate with light grey beds; some fenestral fabric in light grey beds and some zones of authigenic quartz crystals up to 3 cm long; crystals oriented randomly in the plane of bedding; basal contact gradational, continuous.	30.0	(98.4)	641.5	
19	Dolostone (80 per cent exposed): moderately resistant; finely crystalline; light- to medium-brownish grey, weathering light brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; similar to overlying unit but no light grey beds with fenestral fabric observed; basal contact gradational, continuous.	54.5	(178.8)	611.5	
18	Dolostone (50 per cent exposed): most of this unit is vegetation covered; some thick bedded light brownish grey dolomite as in underlying unit; basal contact gradational, continuous.	66.0	(216.5)	557.0	
17	Dolostone A and dolostone B (90 per cent dolostone A, 10 per cent dolostone B).				
	Dolostone A: resistant; finely crystalline; light- to dark-brownish grey, weathering light- to dark-brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; many vuggy beds with several brecciated beds of solution-collapse breccia cemented with white dolomite.				
	Dolostone B: moderately resistant; finely crystalline; light grey, weathering light grey; bedding planar, mode very thin bedded, minimum very thin bedded,				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	maximum thin bedded; faintly laminated, occurs as interbeds within dolostone A.				
	Basal contact gradational, continuous.	30.0	(98.4)	491.0	
16	Dolostone: resistant; finely crystalline; medium- to dark-brownish grey, weathering medium- to dark-brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thick burrow mottled, dark beds grade upwards to lighter, thin beds; some vugs filled with white dolomite and quartz; basal contact gradational, continuous.	48.0	(157.5)	461.0	
15	Dolostone: resistant; finely crystalline; dark grey and brownish grey; weathering dark grey and brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; thick, burrow mottled and amphiporid-bearing beds grade upwards to thin beds; some brecciated horizons with solution-collapse breccias; vugs filled with dolomite and calcite spar; basal contact gradational, continuous.	30.0	(98.4)	413.0	
14	Dolostone: as in overlying unit; some broad, low amplitude (10 cm), wave-like bed forms in thick beds; thinner, light grey beds are laminated and contain algal mat overfolds; basal contact gradational, continuous.	30.0	(98.4)	383.0	
13	Dolostone: resistant; finely crystalline; medium- to dark-greyish brown, weathering medium- to dark-greyish brown; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; well exposed cycles of burrowed, vuggy, dark dolomite with rippled bases and lighter, more recessive laminite tops; thicker burrowed beds have knobbly bed partings; rippled intervals have a discernible, relict, sand-sized, intraclast texture (originally grainstone?); basal contact gradational, continuous.	30.0	(98.4)	353.0	
12	Dolostone: resistant; finely crystalline; medium grey and brownish grey, weathering medium grey and brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; thinner beds are lighter grey and laminated, some laminations are contorted, thicker beds are darker and mottled.	39.0	(128.0)	323.0	
11	Dolostone (75 per cent exposed): moderately resistant; medium crystalline; medium- to dark-grey and brownish grey, weathering medium- to dark-brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some vuggy and fossiliferous bands and some limonitized pyrite streaks; minor solution-collapse brecciation throughout; basal contact gradational, continuous.	30.0	(98.4)	284.0	
10	Dolostone: resistant; finely crsytalline; medium- to dark-brownish grey, weathering medium- to dark-brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some scattered intervals of light grey laminite; basal contact gradational, continuous.	37.5	(123.0)	254.0	
9	Dolostone: resistant; finely crystalline; dark- to medium-brownish grey, weathering dark- to medium-brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; thicker beds are darker brownish grey and slightly vuggy; several intervals of light grey dolomite laminite with needle quartz; basal contact gradational, continuous.	30.0	(98.4)	216.5	
8	Dolostone: resistant; finely crystalline; dark- to medium-brownish grey, weathering dark- to medium-brownish grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; similar to overlying unit but some good stromatactis fabric in a few of the thicker beds; basal contact gradational, continuous.	30.0	(98.4)	186.5	
7	Dolostone: resistant; finely crystalline; dark- to medium-brownish grey, weathering dark- to medium-brownish grey; bedding planar, mode medium bedded, minimum medium bedded, maxium thick bedded; abundant amphiporids and leached amphiporids in some thicker beds; base of thick beds tend to be rippled; many thick beds are capped with a thin bed of light grey to white, pisolitic grainstone with fenestral fabric; dark beds have erosional, basal contacts where they overlie light grey beds; basal contact gradational, continuous.	15.0	(49.2)	156.5	
6	Dolostone: as in the overlying unit but only two light grey intervals; basal contact gradational, continuous.	21.0	(68.9)	141.5	
5	Dolostone: resistant; finely crystalline; dark brownish grey, weathering dark- to medium-brownish grey with thin white bands; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; dark beds grade upwards to light grey beds with fenestral fabric and quartz needles in the plane of bedding; light grey or white beds appear to be pisolitic and contain good fenestral fabric; some rip-up clasts of white dolomite occur at the base of dark, thicker beds that overlie those light grey beds; abundant amphiporids in some dark beds; basal contact gradational, continuous.	16.5	(54.1)	120.5	
	Total thickness of the Amica Formation is 625.5 m (2052.2 ft).				
	Sombre Formation				
4	Dolostone: resistant; finely crystalline; medium- to light-grey, weathering medium- to light-grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; thicker beds of medium grey dolostone grade upwards to light grey dolomite laminite; light grey laminites are overlain by dark grey beds with a sharp contact; basal contact gradational, continuous.	15.0	(49.2)	104.0	(341.2)
3	Dolostone: resistant; finely crystalline; light grey to yellowish grey, weathering light grey to yellowish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; similar to overlying unit but a trace of argillaceous material in the light coloured laminite gives them a yellow tint; basal contact gradational, continuous.	6.0	(19.7)	89.0	
2	Dolostone (80 per cent exposed): moderately resistant; finely crystalline; light grey to yellowish grey, weathering light grey to yellowish grey; bedding planar, mode thick bedded, minimum thin bedded, maximum very thick bedded; thick beds grade upwards to dolomite laminites with a faint yellow tint; basal contact gradational, continuous.	49.5	(162.4)	83.0	
1	Dolostone: resistant; finely crystalline; light grey, weathering light grey; bedding planar to wavy, mode thick bedded, mininum medium bedded, maximum thick bedded; solution-collapse breccias are common and are incompletely filled with white dolomite and quartz and a little malachite and azurite; outlines of many solution-collapse bodies follow wavy sedimentary activation surfaces such as troughs and wave-shaped beds forms; basal contact gradational, continuous.	33.5	(109.9)	33.5	
	Incomplete thickness of the Sombre Formation is 104.0 m (341.2 ft).				
	Total thickness of the First Canyon Section is 837.5 m (2747.7 ft).				

TEXACO RAM PLATEAU N-44 (KB 1842)

SECTION 41. This well section is at Lat. 61°53'07"N; Long. 123°53'36"W in the Sibbeston Lake map area (95G) in the District of Mackenzie, N.W.T.

Unit	Description	Depth below Kelly Bushing (in feet)	Subsea depth (in feet)	Thickness (in metres)
Nahanni Formation	medium grey, skeletal wackestone with corals and stromatoporoids.	198	1644	167.0
Headless Formation	greyish green, argillaceous and bioclastic wackestone with brachiopods.	746	1096	85.0
Landry Formation	tan, pelletal wackestone.	1024	818	71.0
Funeral Formation	light greyish brown, calcareous shale.	1256	586	353.0
Arnica Formation	dark greyish brown, finely crystalline dolomite with crinoids.	2414	-572	40.5+
	T.D.	2547	-705	

PAN AM A-1 MATTSON CREEK (KB 1391)

SECTION 42. This well section is at Lat. 61°02'00"N; Long. 123°48'30"W in the Sibbeston Lake map area (95G) in the District of Mackenzie.

Nahanni Formation	medium grey, skeletal wackestone with stromatoporoids and corals, partly dolomitized.	1651	-260	216.0
Headless Formation	greenish grey, argillaceous wackestone with some brachiopods, partly dolomitized.	2360	-969	42.5
Landry Formation	tan, pelletal wackestone and packstone, largely dolomitized with white, coarsely crystalline, Manetoe dolostone.	2500	-1109	61.0
Arnica Formation	dark brownish grey, finely to medium crystalline dolostone with crinoids (some with 2 holes) and amphiporids.	2700	-1309	505.0
Sombre Formation	light grey, finely crystalline dolostone with scattered silt and sand beds in the basal part.	4355	-2966	822.0
Camsell Formation	grey, finely crystalline dolostone interbedded with sandy and silty yellow finely crystalline dolostone and white finely crystalline anhydrite.	7050	-5659	402.5
Root River Formation?	yellowish orange, silty and sandy, finely crystalline dolostone.	8370	-6979	338.5
Mt. Kindle Formation	greyish brown, coralline dolostone.	9480	-8089	430.0+
	T.D.	10 890	-9499	

RED ROCK PASS

SECTION 43. This is a west-dipping section that extends westward across the Nahanni Range at Red Rock Pass in the Sibbeston Lake map area (95G) in the District of Mackenzie, N.W.T. The base of the section is at Lat. 61°43'N; Long. 123°17'W. This section is summarized and adapted from Section 95-G-4 in Brady and Wissner (1961) and was measured by R.E. Griffiths and D.T. Cosgrove in the summer of 1960.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
102	Limestone: mainly dark grey; very fine to fine crystalline; massive (bedding absent); fossiliferous; abundant colonial corals, (*Priamatophyllum kirkii*), large hexagonia in upper part of interval; 97 P-59-D part of hexagonaria about 2 feet across; other large corals present. Limestone weathers light grey.	22.5	(73.8)	954.0	(3129.9)
101	Limestone: dark grey to black; very fine crystalline; massive, light grey weathering; bottom 10 feet includes some medium grey beds.	13.5	(44.3)	931.5	
100	Limestone: dark grey; fine to very fine crystalline; fossiliferous (small corals); thick bedded, light grey weathering.	15.0	(49.2)	918.0	
99	Limestone: black to very dark grey; very fine to fine crystalline; very argillaceous in part; massive; rubbly and light grey weathering; some stromatoporoids observed.	9.5	(31.2)	903.0	
98	Limestone: medium grey; ultra-fine crystalline.	0.5	(1.6)	893.5	
97	Limestone: dark grey to black; very fine crystalline.	2.5	(8.2)	893.0	
96	Limestone: medium grey; ultra-fine crystalline.	0.5	(1.6)	890.5	
95	Limestone: dark and medium grey; argillaceous in part; very fine crystalline; some fine crystalline, massive, rubbly weathering.	7.0	(23.0)	890.0	
94	Limestone: dark and medium grey; very fine crystalline; thick bedded; corals and gastropods. 97 P-59-A, B.	7.5	(24.6)	883.0	
93	Limestone: medium and light grey; very fine to ultra-fine crystalline; thick bedded.	2.0	(6.6)	875.5	
92	Limestone: dark to medium grey; very fine crystalline; massive; loosely coiled gastropod. 97 P-59-C.	13.5	(44.3)	873.5	
91	Limestone: dark grey to black; very fine crystalline; massive.	3.0	(9.8)	860.0	
90	Limestone: dark grey to black; very fine crystalline; thick and medium bedded.	5.0	(16.4)	857.0	
89	Limestone: medium grey; very fine crystalline; thick and medium bedded. N.B. Lower portion of section was measured across the valley from the upper part.	3.5	(11.5)	852.0	
88	Limestone: dark grey; very fine crystalline; rubbly weathering; thin and thick bedded; fossiliferous at top (Brachiopods, corals, trilobites [proetid]).	18.5	(60.7)	848.5	
87	Limestone: light grey; very fine crystalline; thick bedded.	1.5	(4.9)	830.0	
86	Limestone: light grey; very fine crystalline, thin bedded.	0.5	(1.6)	828.5	
85	Covered. Likely to be underlain by very argillaceous limestone or shale, recessive.	6.0	(19.7)	828.0	
84	Limestone: dark grey; very fine crystalline; medium bedded; rubbly weathering; fossiliferous (colonial corals, ostracodes?, proetid).	3.5	(11.5)	822.0	
83	Limestone: light grey; very fine crystalline; thick bedded.	1.0	(3.3)	818.5	
82	Limestone: dark grey; very fine crystalline; thick beds alternate with rubbly, medium bedded intervals.	3.5	(11.5)	817.5	
81	Limestone: medium grey; very fine crystalline; mainly thick bedded with minor, thin, rubbly beds.	3.0	(9.8)	814.0	
80	Limestone: dark grey; very fine crystalline; rubbly weathering, thin and thick bedded; some poorly preserved gastropods, corals and bryozoan?	9.0	(29.5)	811.0	
79	Limestone: light, medium and dark grey beds; thick bedded; very fine crystalline.	7.5	(24.6)	802.0	
78	Limestone: light and medium grey; very fine crystalline; thin bedded.	5.0	(16.4)	794.5	
77	Limestone: dark grey; very fine crystalline; thick bedded; contains some poorly preserved corals.	9.5	(31.5)	789.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
76	Limestone: light grey; very fine crystalline; chiefly thick bedded with some medium beds.	13.5	(44.3)	780.0	
75	Limestone: dark grey; very fine crystalline; contains fossil fragments, possibly corals.	0.5	(1.6)	766.5	
74	Limestone: light grey; very fine crystalline; thick bedded.	9.0	(29.5)	766.0	
73	Limestone: light and medium grey; very fine crystalline; thin and thick bedded.	5.0	(16.4)	757.0	
72	Limestone: medium grey; very fine crystalline; medium and thick bedded.	2.0	(6.6)	752.0	
	Incomplete thickness of the Nahanni Formation is 204.0 m (669.3 ft).				
	Headless Formation				
71	Limestone: medium grey; very fine crystalline; rubbly; fossiliferous (corals); some greenish grey shale partings.	0.5	(1.6)	750.0	(2460.6)
70	Limestone: dark- to medium-grey; very fine crystalline; thick and medium bedded.	2.5	(8.2)	749.5	
	Total thickness of the Headless Formation is 3.0 m (9.8 ft).				
	Landry Formation				
69	Dolostone: yellow to buff; coarse to fine crystalline; very unhomogeneous; vugular; contains some calcite, appears to lense out laterally into light grey, very fine crystalline limestone.	2.0	(6.6)	747.0	(2450.8)
68	Dolostone: dirty white; coarse to very coarse crystalline; poorly medium bedded; contains calcite; recessive.	4.0	(13.1)	745.0	
67	Limestone: light- to medium-grey; very fine crystalline; thick bedded.	3.5	(11.5)	741.0	
66	Limestone: dark grey; very fine crystalline; thick bedded.	2.0	(6.6)	737.5	
65	Limestone: medium- to light grey; very fine crystalline; thin, medium and thick bedded; some 1/8" hematite crystals scattered through some beds.	5.0	(16.4)	735.5	
64	Limestone: medium- to light-grey; very crystalline; medium and thick bedded.	4.5	(14.8)	730.5	
63	Covered.	0.5	(1.6)	726.0	
62	Limestone: medium- to light-grey; very fine crystalline; medium and thick bedded.	3.0	(9.8)	725.5	
61	Limestone: black, argillaceous.	0.5	(1.6)	722.5	
60	Limestone: medium- to light-grey; very fine crystalline; medium and thick bedded.	13.5	(44.3)	722.0	
59	Limestone: medium- to dark-grey; very fine crystalline; medium- to thick bedded.	7.5	(25.6)	708.5	
	Total thickness of the Landry Formation is 46.0 m (150.9 ft).				
	Arnica Formation				
58	Dolostone: light grey and coarse crystalline; white; very irregular banding; with drusy vugs partially filled with calcite. Effective porosity poor to fair. Manetoe facies.	17.5	(57.4)	701.0	(2299.9)
57	Dolostone: alternating light and dark grey bands several feet thick. A few thin bands shot with thin veins of white dolomite. Occasional bands of brecciated and re-crystallized dolomite. Manetoe facies.	29.0	(95.1)	683.5	
56	Dolostone: alternate light and dark grey; some light saccharoidal beds; mainly fine crystalline; trace of poor, vuggy porosity.	8.0	(26.2)	654.5	
55	Dolostone: dark grey; fine crystalline; small veins of white dolomite.	3.0	(9.8)	646.5	
54	Dolostone: dark grey; brecciated; resembles "Bear Rock".	1.5	(4.9)	643.5	
53	Dolostone: alternate light and dark grey; fine crystalline; thick bedded.	13.0	(42.7)	642.0	
52	Dolostone: alternate light and dark grey; mainly light medium crystalline; saccharoidal; a few narrow bands of brecciated dolomite.	26.0	(85.3)	629.0	
51	Dolostone: mainly coarse, white, re-crystallized; some poor, vuggy porosity.	6.0	(19.7)	603.0	
50	Dolostone: alternate light and dark grey; some beds saccharoidal; mainly medium crystalline. Sample 1G-60-6.	32.0	(105.0)	597.0	
49	Covered.	1.5	(4.9)	565.0	
48	Dolostone: alternate light and dark grey; mainly fine crystalline; some beds saccharoidal; a few bands of poor, vuggy porosity.	17.0	(55.8)	563.5	
47	Covered.	2.0	(6.6)	546.5	
46	Dolostone: alternate light and dark grey; mainly fine crystalline; some beds saccharoidal; a few bands of poor, vuggy porosity.	9.0	(29.5)	544.5	
45	Dolostone: alternate light and dark grey; fine- to medium-crystalline; some light coloured saccharoidal beds; occasional band of poor, vuggy porosity. Top of unit contains a 6" band of breccia of dark dolomite fragments cemented with dolomite.	44.0	(144.4)	535.5	
44	Dolostone: same as above. Top of unit contains a 2" band of breccia.	78.0	(255.9)	491.5	
43	Covered.	1.5	(4.9)	413.5	
42	Dolostone: dark grey; fine crystalline; thick bedded.	16.0	(52.5)	412.0	
41	Dolostone: dark grey; fine crystalline; contains abundant, small crinoid stems and a few, poorly preserved brachiopods and corals; some white weathering dolomite which is light grey and coarser crystalline; bedding indistinct.	27.5	(90.2)	396.0	
40	Covered.	1.5	(4.9)	368.5	
39	Dolostone: chalk grey; fine crystalline; abundant, small crinoid stems; some large, dolomite filled vugs and veinlets of white dolomite.	10.5	(34.5)	367.0	
38	Covered.	4.5	(14.8)	356.5	
37	Covered.	6.0	(19.7)	352.0	
36	Dolostone: alternate dark and light grey; medium- to thick-bedded; some 1/2" to 1" vuggy porosity mainly filled with dolomite; some small crinoids and a few brachiopods.	13.5	(44.3)	346.0	
35	Covered.	2.0	(6.6)	332.5	
34	Dolostone: dark grey; fine crystalline; abundant crinoid stems.	1.5	(4.9)	330.5	
33	Dolostone: alternate light and dark grey; fine crystalline; medium bedded; occasional band of vuggy porosity; 20 feet from bottom is a one-foot band of wormy porosity.	23.5	(77.1)	329.0	
32	Partly covered: appears to be same as that below.	15.0	(49.2)	305.5	
31	Dolostone: dark grey; fine crystalline; abundant wormy porosity partially filled with white dolomite.	2.0	(6.6)	290.5	
30	Dolostone: dark grey, alternating with light grey; fine crystalline; medium bedded; some poor to fair, vuggy porosity in bands. Some hematitic crystals seen in light grey bands. (This unit is the first appearance of dark grey dolomite in the section and could possibly represent the base of the Lone Mountain. Brady and Wissner, 1961.)	20.0	(65.6)	288.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
29	Dolostone: light grey; mainly medium and thick bedded with occasional thin bedded break; scattered small vugs, giving fair to poor porosity in 1 foot bands; mainly fine crystalline with some beds saccharoidal; some chert filled vugs (replaced fossils); some buff weathering beds in bottom 90 feet.	78.5	(257.5)	268.5	
28	Covered.	2.5	(8.2)	190.0	
27	Dolostone: light grey; fine crystalline; medium to thick bedded; some beds saccharoidal; some bands of poor, vuggy porosity.	30.0	(98.4)	187.5	
26	Mainly covered. 1" of light grey dolomite occurs in middle of interval.	27.0	(88.6)	157.5	
25	Dolostone: medium grey; fine crystalline; mainly massive; scattered bands of poor, vuggy porosity.	8.5	(27.9)	130.5	
24	Covered.	18.5	(60.7)	122.0	
23	Dolostone: medium grey; fine to very fine crystalline; occasional band of poor, vuggy porosity; mainly massive; weathers light grey.	16.0	(52.5)	103.5	
	The total thickness of the Arnica Formation is 613.5 m (2012.8 ft).				
	Silurian-Devonian Undivided				
22	Covered. No outcrop.	0.5	(1.6)	87.5	(287.1)
21	Dolostone: medium grey; very arenaceous; thin bedded.	0.5	(1.6)	87.0	
20	Covered. No outcrop.	2.0	(6.6)	86.5	
19	Dolostone: light grey; fine crystalline; varies from slightly to very arenaceous.	6.5	(21.3)	84.5	
18	Sandstone: light grey; fine grained; well rounded and sorted, clear quartz grains; dolomitic; tight; buff weathering.	1.0	(3.3)	78.0	
17	Dolostone: medium grey; very fine crystalline; very slightly arenaceous; mainly medium bedded; poor, scattered, vuggy porosity; cliff-forming; buff weathering.	30.0	(98.4)	77.0	
16	Covered.	3.0	(9.8)	47.0	
15	Sandstone: light grey; fine grained; well rounded and sorted, clear quartz grains; dolomitic; hard; tight; buff weathering.	3.0	(9.8)	44.0	
14	Mainly covered. Probably light grey dolomite.	1.5	(4.9)	41.0	
13	Sandstone: light grey; fine grained; well rounded and sorted clear quartz; dolomitic; contains irregular lenses of dolomite 1" to 2" thick; hard; tight.	1.0	(3.3)	39.5	
12	Dolostone: medium grey; fine to very fine crystalline; medium- to thick-bedded; 5 feet from top is a 1 foot band of arenaceous dolomite.	4.5	(14.8)	38.5	
11	Covered.	2.0	(6.6)	34.0	
10	Dolostone: medium grey; fine to very fine crystalline; arenaceous in part; thin and medium bedded.	15.0	(49.2)	32.0	
9	Sandstone: light grey; buff weathering; well rounded; medium to coarse grained; hard; tight; dolomitic.	2.0	(6.6)	17.0	
8	Covered.	1.0	(3.2)	15.0	
7	Sandstone: as above.	1.0	(3.2)	14.0	
6	Dolostone: light grey; arenaceous; thin bedded; buff weathering.	2.5	(8.2)	13.0	
5	Sandstone: light grey; medium grained; dolomitic; thin and medium bedded; tight; buff weathering.	2.0	(6.6)	10.5	
4	Dolostone: light grey; arenaceous; thin and medium bedded.	1.0	(3.2)	8.5	
3	Covered.	1.0	(3.2)	7.5	
2	Dolomitic sandstone and arenaceous dolomite: irregularly interbedded and some alternating beds; fine to medium grained; well sorted in part; light grey; thin- to medium-bedded.	5.0	(16.4)	6.5	
1	Covered.	1.5	(4.9)	1.5	
	Total thickness of the Silurian-Devonian Undivided is 87.5 m (287.1 ft).				
	The underlying Mount Kindle and Franklin Mountain formations were described by Meijer Drees in 1975.				

GRAINGER RIVER SECTION

SECTION 66. This is a west-dipping section that extends westward across the Nahanni Range in the Virginia Falls map area (95F) in the District of Mackenzie, N.W.T. It begins at Lat. 61°19'N; Long. 123°23'W (or 6798600N, 479300E in UTM coordinates) and is best shown in RCAF air photo A18041-52.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
17	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium grey; bedding wavy to planar, mode thick bedded, minimum medium bedded, maximum thick bedded; abundant hemi-spheroidal stromatoporoids and corals; patchy dolomitization; basal contact gradational, continuous.	51.0	(167.0)	353.5	(1815.9)
16	Limestone: resistant; fossiliferous wackestone; medium- to dark-grey, weathering medium- to dark-grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; some biostromal beds with abundant stromatoporoids and colonial corals; several black chert nodule zones; basal contact gradational, continuous.	38.5	(126.3)	302.5	
15	Limestone: moderately resistant; pelletal and argillaceous grainstone and wackestone; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum very thin bedded, maximum thick bedded; basal contact gradational, continuous.	40.5	(132.9)	464.0	
	Incomplete thickness of the Nahanni Formation is 130.0 m (426.5 ft).				
	Headless Formation				
14	Limestone and dolostone (50 per cent exposed, 90 per cent limestone, 10 per cent dolostone).				
	Limestone: moderately recessive; pelletal and argillaceous wackestone; medium greenish grey, weathering medium greenish grey; bedding planar to wavy, mode medium bedded, minimum thin bedded, maximum medium bedded; green, argillaceous, wavy partings are abundant; some finely comminuted skeletal debris (brachiopods?).				
	Dolostone: moderately resistant; coarsely crystalline; light grey to white, weathering light brownish grey to white; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; this dolomite is a replacement after the limestone of this unit and is part of the Manetoe facies.				
	Basal contact gradational, continuous.	49.5	(162.4)	423.5	(1389.4)
	Total thickness of the Headless Formation is 49.5 m (162.4 ft).				
	Landry Formation				
13	Limestone and dolostone (90 per cent exposed, 70 per cent limestone, 30 per cent dolostone).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Limestone: resistant; pelletal grainstone; medium brown, weathering medium grey; bedding planar to broadly wavy, mode medium bedded, minimum thin bedded, maximum thick bedded; blocky parting; some ostracodes.				
	Dolostone: resistant; coarsely crystalline; light brown to white, weathering light grey to white; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; a replacement after the lime grainstone of this unit and is part of the Manetoe facies.				
	Basal contact gradational, continuous.	30.0	(98.4)	3740.0	
	Total thickness of the Landry Formation is 30.0 m (98.4 ft).				
	Arnica Formation				
12	Dolostone (90 per cent exposed): resistant; coarsely crystalline; dark brownish grey mottled white, weathering medium- to dark-brownish grey mottled white; bedding planar, mode thick bedded, minimum medium bedded, maximum very thick bedded; most of this unit is a solution-collapse mosaic and rubble breccia with fragments of moderately vuggy (fossiliferous?), dark host dolomite cemented by, and partly replaced by coarsely crystalline, white dolomite and is part of the Manetoe facies; breccia bodies tend to be stratabound; basal contact abrupt.	39.0	(128.0	344.0	(1128.6)
11	Dolostone: resistant; coarsely crystalline; medium brownish grey mottled white, weathering light brownish grey mottled white; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; similar to the overlying brecciated unit but with a larger proportion of white dolomite that is part of the Manetoe facies; basal contact gradational, continuous.	18.0	(59.1)	305.0	
10	Dolostone (50 per cent exposed): moderately resistant; finely to coarsely crystalline; dark brownish grey mottled white, weathering medium- to dark-brownish grey mottled white; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; abundant stratiform bodies of solution-collapse mosaic and rubble breccia with fragments of dark host dolomite cemented by white coarsely crystalline dolomite that is part of the Manetoe facies; white dolomite has replaced host dolomite along bedding planes to form zebra texture; some beds of host dolomite are populated with amphipora (leached); some large stromatactis vugs are floored with dark grey carbonate sediment; basal contact gradational, continuous.	13.5	(44.3)	287.0	
9	Dolostone (50 per cent exposed): moderately resistant; finely to medium crystalline; dark brownish grey to light grey, weathering medium brownish grey with light grey bands; bedding planar, mode thick bedded, minimum thick bedded, maximum very thick bedded; dark vuggy beds grade upward to light grey dolomite laminite beds containing fenestral fabric in repetitive cycles averaging 2 m thick; some light grey bands contain abundant elongate quartz crystals up to 10 cm long and oriented randomly in the plane of bedding; basal contact gradational, continuous.	52.5	(172.2)	273.5	
8	Dolostone (50 per cent exposed): moderately resistant; finely crystalline; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum thick bedded, very thick bedded; slightly vuggy, a very homogeneous unit; basal contact gradational, continuous.	24.0	(78.7)	221.0	
7	Dolostone (70 per cent exposed): moderately resistant; finely crystalline; medium grey to brownish grey, weathering medium grey to brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; a homogeneous unit of slightly vuggy and fossiliferous dolomite; basal contact gradational, continuous.	19.5	(64.0)	197.0	
6	Dolostone (35 per cent exposed): moderately resistant; finely crystalline; medium brownish grey, weathering medium brownish grey; bedding planar, mode thick bedded, minimum medium bedded, maximum thick bedded; homogeneous, slightly vuggy dolomite, unit covered with vegetation; basal contact gradational, continuous.	36.0	(118.1)	177.5	
5	Dolostone (80 per cent exposed): resistant; finely to medium crystalline; medium grey, weathering medium grey; bedding planar, mode thick bedded, minimum medium bedded maximum thick bedded; several bodies of stratiform solution-collapse breccia; basal contact gradational, continuous.	45.0	(147.6)	141.5	
4	Dolostone: resistant; finely crystalline; dark brownish grey banded with light grey, weathering medium brownish grey banded with light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; repetitive cycles of dark, vuggy dolostone grading upwards to light grey laminite containing fenestral fabric; dark dolostone rests with an erosional contact on light grey dolostone; chips of light grey dolostone are commonly reworked into the dark dolostone overlying light grey dolostone; basal contact gradational, continuous.	15.0	(49.2)	96.5	
3	Dolostone: resistant; finely crystalline; dark brownish grey banded light grey, weathering medium- to dark-brownish grey banded light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; repetitive dark- to light-grey cycles as in the overlying unit; some pene-contemporaneous mud chip breccias in some light grey laminites; some solution-collapse breccia in the dark dolomite with an open space filling of white dolomite and quartz; basal contact gradational, continuous.	15.0	(49.2)	81.5	
2	Dolostone: resistant; finely crystalline; similar to overlying unit with dark, vuggy dolostone grading upwards to light grey laminite in repetitive cycles about 2 m thick; pisolitic dolomitized grainstone and fenestral fabric are common in the light grey laminites; small scour fillings are common at the bases of some dark beds; basal contact gradational, continuous.	30.0	(98.4)	66.5	
1	Dolostone: resistant; finely crystalline; dark grey dolostone grades upwards to light grey dolostone in 1.5 m thick cycles as in overlying units; slope covered with vegetation below this unit but contact with underlying Silurian-Devonian rocks is about 30 m below this unit.	31.5	(103.3)	31.5	
	Incomplete thickness of the Arnica Formation is 344.0 m (1128.6 ft).				
	Total thickness of the Grainger River Section is 553.5 m (1815.9 ft).				

NAHANNI BUTTE SECTION

SECTION 65. This is a northwestward-dipping section that begins at Lat. 61°03'N; Long. 123°20'W (or 6771500N, 481900E in UTM coordinates). It extends upwards across the south-facing exposure of Nahanni Butte at the south end of the Nahanni Range, N.W.T. The section is best seen in RCAF air photo A18041-112. Thicknesses were measured using a Jacob's staff. This is the type section of the Nahanni Formation (Douglas and Norris, 1961).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Nahanni Formation				
18	Limestone (90 per cent exposed): fossiliferous wackestone; dark grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; same as in Unit 17 but pods of silicified limestone breccia are larger with some breccia bodies up to 20 m broad and 5 m thick; breccia tends to weather a brownish red or rusty colour; basal contact gradational, continuous. The upper part of this unit is covered where it is overlain by the shaly siltstones of the Fort Simpson Formation.	24.0	(78.7)	336.5	(1104.0)
17	Limestone: fossiliferous; wackestone; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; crinoids and brachipods are common, some beds with silicified limestone breccia formed of clasts up to 10 cm long; many dark grey chert nodules up to 20 cm long that appear deformed; basal contact gradational, continuous.	34.0	(111.5)	312.5	
16	Limestone: fossiliferous; wackestone; siliceous; medium- to dark-grey, weathering medium grey; bedding planar, mode medium bedded, minimum medium bedded, maximum medium bedded; amphiporid-like corals are abundant with crinoids, brachiopods and gastropods, pyrite and bitumen are common, some silicification has occurred; basal contact erosional.	22.5	(73.8)	278.5	
15	Dolostone: medium to coarsely crystalline; white, weathering light grey; bedding planar, mode very thick bedded, minimum thick bedded, maximum very thick bedded; dolomitized limestone like that in Unit 9; basal contact abrupt. This unit is part of the Manetoe facies.	7.0	(23.0)	236.0	
14	Limestone: pelletal and fossiliferous wackestone; brownish grey, weathering light- to medium-grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; some lighter grey mottled beds (mottles are dolomitized) with fenestral fabric beneath some mottled beds; zones of fenestral fabric tend to contain intraclasts; crinoids, gastropods and corals are common; many bioclasts are silicified; basal contact gradational, continuous.	7.5	(24.6)	249.0	
13	Limestone: fossiliferous and skeletal wackestone; some quartz silt; medium grey, weathering dark grey; bedding planar, mode medium bedded, minimum thin bedded, maximum thick bedded; some wackstone has a light grey mottle fabric; echinoids, gastropods, crinoids and brachiopods are common; some amphiporid-like coral zones are up to 10 cm thick; bitumen and/or sapropel is abundant; basal contact gradational, continuous.	18.0	(59.1)	241.5	
12	Dolostone (5 per cent exposed): medium crystalline; light grey, weathering light grey; bedding planar, mode medium, minimum thin bedded, maximum medium bedded; dolomitized limestone like that in Unit 9; basal contact gradational, continuous. This unit is part of the Manetoe facies.	15.0	(49.2)	223.5	
11	Dolostone: medium to coarsely crystalline; light grey, weathering light grey; bedding planar, mode medium bedded, minimum thin bedded, maximum very thick bedded; a dolomitized, fossiliferous limestone with abundant thamnoporid-like corals, abundant bitumen; basal contact gradational, continuous. This unit is part of the Manetoe facies.	21.0	(68.9)	208.5	
10	Dolostone: medium to coarsely crystalline with many patches of undolomitized dark grey limestone (fossiliferous wackestone); medium grey, weathering light grey; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; some brecciated intervals in which large vugs are lined with white quartz, mainly mosaic breccia; basal contact gradational, continuous. This unit is part of the Manetoe facies.	39.0	(128.0)	187.5	
9	Limestone: slightly fossiliferous wackestone with some calcispheres and ostracodes; impurities, quartz silt; medium grey, weathering medium grey; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; some thin, mineralized veins like that described in Unit 3 continue up through this unit nearly to the top of the Nahanni Formation; breccia zones border the vein and dolomitization of beds around the vein is extensive; intercrystalline bitumen and/or sapropel is common; basal contact gradational, continuous.	7.5	(24.6)	148.5	
	Total thickness of the Nahanni Formation is 193.5 m (641.4 ft).				
	Headless Formation				
8	Limestone: pelletal wackestone with some scattered mud lump intraclasts; impurities; clay in thin greyish green, argillaceous seams commonly in lenticles with mud lump intraclasts; medium brown, weathering medium- to dark-grey; bedding crinkly, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational, continuous.	4.5	(14.8)	141.0	(462.6)
7	Limestone (90 per cent exposed): dark grey weathering grainstone; some calcispheres and ostracodes; some detrital quartz silt; many beds partly dolomitized by light brown, coarsely crystalline dolomite; individual limestone beds are totally dolomitized laterally with a sharp contact between undolomitized limestone and totally dolomitized limestone; intercrystalline bitumen in dolomite; bedding wavy, mode medium bedded, minimum medium bedded, maximum thick bedded; basal contact gradational, continuous. This unit contains some Manetoe facies dolomite.	3.0	(9.8)	136.5	
	Total thickness of the Headless Formation is 7.5 m (24.6 ft).				
	Arnica Formation				
6	Dolostone (100 per cent exposed): colour and weathering as in Unit 4; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; most of unit is bedded, greyish brown, medium crystalline dolomite with a few beds of "zebra" striped dolomite; white stripes of zebra pattern formed by very coarsely crystalline white dolomite; basal contact gradational, continuous. This unit is part of the Manetoe facies.	6.0	(19.7)	133.5	(438.0)
5	Dolostone (100 per cent exposed): light- to medium-greyish brown, weathering medium- to light-brownish grey; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; most of unit is brecciated with large, angular, platy clasts several metres long; porosity infilled with very coarsely crystalline white dolomite; some "zebra" rock and brecciated "zebra" rock; some limonite staining, unbrecciated brown dolomite is finely to medium				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	crystalline; basal contact gradational, continuous. This unit is part of the Manetoe facies.	51.0	(167.3)	127.5	
4	Dolostone (100 per cent exposed): light- to dark-greyish brown, weathering light- to dark-brown; bedding planar, mode very thick bedded, minimum very thick bedded, maximum nonbedded; interbedded dark and medium greyish brown, medium crystalline dolomite; some intervals of solution-collapse breccia with large (less than 1 m), equant to platy clasts; porosity infilled with very coarsely crystalline white dolomite and displaying in some places a zebra striped pattern; basal contact gradational, continuous. This unit is part of the Manetoe facies.	27.0	(88.6)	76.5	
3	Dolostone (100 per cent exposed): finely to medium crystalline; medium greyish brown, weathering light greyish brown; bedding planar, mode very thick bedded, minimum very thick bedded, maximum very thick bedded; a nearly vertical mineralized vein 0.5 m to 1.0 m wide transects this unit; most of vein is limonite after pyrite but the presence of a green stain may indicate the presence of copper; a zone of breccia several metres broad borders the vein deposit; basal contact gradational, continuous. This unit is part of the Manetoe facies.	31.5	(103.3)	49.5	
2	Dolostone (100 per cent exposed): light brown, sucrosic dolomite with some large irregularly-shaped areas of solution-collapse breccia; angular clasts (less than 20 cm long) infilled with coarsely crystalline white dolomite; weathering medium greyish brown; bedding planar, mode medium bedded, minimum medium bedded, maximum thick bedded; basal contact gradational, continuous. This unit is part of the Manetoe facies.	6.0	(19.7)	18.0	
1	Dolostone (100 per cent exposed): alternating beds of light brownish grey and dark brownish grey dolostone that weather light and medium grey; lighter coloured beds are laminated and contain thin zones of breccia (clasts angular less than 4 cm long); finely crystalline dolomite; these poorly sorted breccia may be tectonic in origin; bedding planar, mode medium bedded, minimum thin bedded, maximum medium bedded; basal contact gradational, continuous.	12.0	(39.4)	12.0	
	Incomplete thickness of the Arnica Formation is 133.5 m (438.0 ft).				
	Total thickness of the Nahanni Butte Secton is 333.5 m (1100.7 ft).				

TRENCH CREEK SECTION

SECTION 96. This is an eastward-dipping section that begins at Lat. 62°30'N; Long. 126°49'W and extends eastward along the north side of Trench Creek in the east-central part of the Root River map area (95K) in the Northwest Territories. It is best seen in RCAF air photo A17629-96. This section includes the Cadillac Formation, the Vera Formation, the Camsell Formation, the Sombre Formation, the Arnica Formation, the Funeral Formation, the Landry Formation, the Headless Formation, the Nahanni Formation and part of the Road River Formation. The thicknesses of many units were calculated photogrammetrically after a traverse across these units.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Landry Formation				
14	Limestone: argillaceous; resistant; bluish grey ridge-former of rhythmically bedded limestone; thin bedded, platy, argillaceous, lime mudstones grade upwards to resistant, thick, grey, pelletal wackestone beds in 3 m thick cycles.	229.0	(751.3)	2447.5	(8029.9)
	Total thickness of the Landry Formation is 229.0 m (751.3 ft).				
	Funeral Formation				
13	Limestone: argillaceous; moderately recessive; yellowish brown weathering, faintly laminated, dark grey argillaceous platy lime mudstone; very thin lime mudstones with yellow, argillaceous parting; unit extends eastward upslope, leading to massive Landry limestone cliff; some solitary, medium, lime mudstone beds with a faint pink tint, punctuate the upper part of the sequence beneath the Landry cliff; one 6.0 m thick crinoidal wackestone bed at the base of the unit rests with an irregular, possibly disconformable contact on the underlying Arnica.	257.0	(843.2)	2218.5	(7278.5)
	Total thickness of the Funeral Formation is 257.0 m (843.2 ft).				
	Arnica Formation				
12	Dolostone: resistant; dark brownish grey; medium bedded and slightly crinoidal unit that forms a hill and upslope almost black near contact with Funeral Formation; this unit was not well examined; beds near upper contact are a white, dolomite-cemented, mosaic breccia.	143.0?	(469.2)	1961.5	(6435.4)
	Total thickness of the Arnica Formation is 143.0 m (469.2 ft).				
	Sombre Formation				
11	Dolostone: resistant; light grey cliff-former, but unit has several southward flowing creeks transversing it; medium and light grey, medium- to thin-bedded dolostone and dololaminite rhythms; some biogenic vugs in medium grey dolostones; Sombre ends at a creek; some structural breaks in the Sombre-Arnica interval.	286.0?	(938.3)	1818.5	(5966.2)
	Total thickness of the Sombre Formation is 286.0 m (938.3 ft).				
	Camsell Formation				
10	Limestone (breccia): a resistant light grey and yellowish orange weathering unit which is the main cliff-former of the Camsell; the unit extends up over a hill and down to a vegetation covered bench on the east side; massive grey cliffs with poorly preserved but distinct, thick to very thick, planar bedding of mosaic and rubble packbreccia? in recrystallized limestone (dedolomitized?); these cliffs are separated by thinner intervals (3 or 4) of yellowish orange weathering, recessive, platy, reddish orange, silty, recrystallized limestone (dedolomite?) rubble and mosaic packbreccia; large grey cliff at high point on hill contains abundant, large, reddish-yellow blocks (from a few centimetres to few metres across), from a distance this unit exhibits large-scale, wavy bedding and contortions.	331.5	(1087.6)	1532.5	(5027.9)
9	Limestone (breccia): recessive; yellow weathering; unit extends across the saddle to the first Camsell cliff; a very poorly exposed unit of thin to medium bedded, cemented? crackle and mosaic packbreccia of recrystallized lime mudstone?, abundant scree of pebble-sized grey and yellow breccia fragments.	83.0	(272.3)	1201.0	
8	Limestone (breccia): recessive unit continuing downslope to a saddle; light grey, crackle breccia or fractured, thick bedded, recrystallized lime mudstone with a few relatively more recessive, thin, yellow, platy, argillaceous lime mudstone intervals; gradational lower contact.	65.0	(213.3)	1118.0	
	Total thickness of the Camsell Formation is 479.5 m (1573.2 ft).				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Vera Formation				
7	Limestone and argillaceous limestone: recessive; greyish brown weathering unit leading downslope; this unit is a sandwich with argillaceous, yellow mottled, skeletal wackestone as in Unit 6 between two intervals of thin- to medium-, smooth bedded, lime mudstone with thin bed partings of argillaceous material; scattered brachiopods on bed surfaces.	100.5	(329.7)	1053.0	(3454.0)
6	Argillaceous limestone and silty dolostone: a well marked, recessive, brown weathering and vegetation covered unit leading downslope, only 60 per cent exposed; thin to very thin, planar to irregular, or nodular bedding; argillaceous, skeletal wackestone with abundant crinoids, amphiporids, brachiopods, gastropods and some small orthoconic cephalopods; green and yellow, argillaceous material concentrated on lumpy bed surfaces to form a yellowish green mottling; striped yellow, green and grey; some intervals of yellowish orange, silty and calcareous, platy dolostone interbedded in lower part of the unit; a gradational contact with the underlying unit.	97.5	(319.9)	952.5	
	Total thickness of the Vera Formation is 198.0 m (649.6 ft).				
	Cadillac Formation				
5	Dolostone: silty; resistant; bright reddish orange unit that extends eastward over the main summit; very thin to thin, smooth and planar bedded; greyish orange, weathering orange; silt and fine sand occur in thin laminations and outline ripples in rippled intervals that are about 0.5 m thick; some burrowed intervals with vertical burrows near the middle of the unit.	172.0	(564.3)	855.0	(2805.1)
4	Silty dolostone and argillaceous limestone: slightly recessive, yellow weathering, lower part but upper part more resistant and reddish orange weathering; unit leads eastward along bench and up a slope to close to main summit; lower part is platy, smooth bedded, yellowish grey, argillaceous lime mudstone that passes gradationally upwards to laminated and very thin bedded, platy, orange, silty dolostone in the more resistant steeper part of the unit; the brachiopod *Orbiculoidea* is common on some bed surfaces.	143.0	(469.2)	683.0	
3	Silty dolostone and dolomitic limestone: dolomitic; a steep, resistant, orange unit with resistant ribs of grey, dolomitic limestone, vegetation covered with 70 per cent exposure; orange and red weathering, faintly laminated, dark grey, platy and silty dolostone; some current ripples in platy dolostone; several prominent limestone ribs of ribble floatbreccia in upper part of unit; a large 2 m thick, crinoid particulate rubble floatbreccia marks the top of the unit; large, poorly sorted clasts of skeletal wackestone (up to 0.25 m long) are suspended in a crinoidal wackestone matrix; brachiopod and coral fragments also common in fragments and matrix.	200.0	(656.2)	540.0	
2	Dolostone: silty, bright orange unit that leads eastward upslope from valley floor; very thin to thin, planar bedded, platy, bright orange weathering, dark grey, silty dolostone in lower part; laminated and platy in upper bench-forming upper part; abrupt but gradational contact with underlying unit.	143.0	(469.2)	340.0	
	Total thickness of the Cadillac Formation is 658.0 m (2158.8 ft).				
	Road River Formation				
1	Limestone and shale: recessive; greyish yellow unit that occupies valley floor; very poorly exposed (30% exposed); a laminated to thin bedded, platy, argillaceous lime mudstone with some vegetation covered shaly intervals.	197.0	(646.3)	197.0	(646.3)
	Incomplete thickness of the Road River Formation is 197.0 m (646.3 ft).				
	Total thickness of the Trench Creek Section is 2247.5 m (7373.7 ft).				

PASTEL CREEK SECTION

SECTION 67. This is an eastward-dipping cross-section that begins at Lat. 62°47'30"N; Long. 125°16'W. It extends eastward along the north side of an eastward flowing tributary of Pastel Creek in the northern part of the Root River map area (95K) in the Northwest Territories. The section is best seen in RCAF air photo A18045-137. This section includes part of the Whittaker Formation, the Road River, the Root River and Vera, the Camsell, the Sombre and the Arnica formations and is the type section of the Root River Formation (formerly the Delorme Formation type section).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Landry Formation				
28	Dolostone (breccia): resistant cliff-former; a white to light grey continuation of the underlying cliff; cemented mosaic and rubble packbreccia in medium planar bedded, light grey, dolomitized lime mudstone (dolomitized Landry); white dolomite cement; 60 m estimated to light grey Landry in valley floor; Manetoe facies of Landry Formation.	20.0	(65.6)	2583.5	(8476.0)
	Incomplete thickness of the Landry Formation is 20.0 m (65.6 ft).				
	Arnica Formation				
27	Dolostone (breccia): resistant; cliff-forming, light and dark grey dolostone breccia; a cemented rubble packbreccia of elongate, subangular fragments of dark and light grey, finely to medium crystalline dolostone (Arnica-like) cemented by coarsely crystalline, white dolomite; some crackle and mosaic breccia where thick bedding is only slightly disrupted; Manetoe facies of Arnica Formation.	40.0	(131.2)	2563.5	(8410.4)
26	Dolostone: moderately resistant; brown weathering unit leads eastward downslope to the contact with the Manetoe facies dolomite in the Landry Formation; thick bedded, brown biostromal dolostone with four light grey dolomitized crinoid packstones (encrinite) in the upper part of the unit above.	58.5	(191.9)	2523.5	
25	Dolostone: moderately resistant; greyish brown unit extends over a high point in the ridge line; thick intervals of greyish brown, medium to very thick bedded crinoidal dolostone separated by thinner, recessive, light grey dolalaminite intervals or featureless medium grey dolostone; a slightly colour banded appearance.	151.5	(497.0)	2465.0	
	Total thickness of the Arnica Formation is 250.0 m (820.2 ft).				
	Sombre Formation				
24	Dolostone: unit extends eastward upslope along the ridge to just below a prominent high point; moderately resistant but not cliff-forming; light grey and smooth weathering; medium- to light-grey, fine to medium crystalline, thin to thick planar bedded crinoidal dolostone; one rough weathering brown bed near base and two near top.	144.0	(472.4)	2313.5	(7590.2)
23	Dolostone: very resistant knob of white, biostromal, medium crystalline dolostone with abundant, large vugs; leached stromatoporoids or stromatactis infilled with coarsely crystalline white dolomite.	10.5	(34.4)	2169.5	

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
22	Dolostone: resistant and cliff-forming; greyish brown, biostromal with 1–3 cm vugs strung out parallel to bedding; scattered crinoids; medium to very thick planar bedding, medium to thick beds pass upwards to thick and very thick bedding which forms a cliff that becomes more prominent between 134 m and 150.5 m above the base of the unit; the thick beds at the top of the prominent interval are light grey, dolomitized crinoidal packstone (encrinite); above the prominent interval is less resistant, dark brown (bituminous), sucrosic dolostone with scattered crinoids; some two-holed crinoids.	203.0	(666.0)	2139.0	
21	Dolostone: recessive; light to medium grey and yellowish grey unit with poor outcrop (~20%) leads up to the first bench on the east side of the saddle; medium planar beds with some thin and thick beds; dark and light grey couplets as in Unit 20 but light grey is more common and some yellow, silty dololaminite is present.	125.0	(410.1)	1936.0	
20	Dolostone: moderately resistant; medium grey banded unit starts on bench and leads down to saddle; medium to thick planar bedding in which dark grey, featureless dolostone grades upward to light grey dololaminite that contains some algal laminations; these dark grey-light grey couplets are commonly about 1 m thick and have faintly erosional bases; an abrupt contact with the underlying unit.	110.0	(360.9)	1831.0	
	Total thickness of the Sombre Formation is 592.5 m (1943.9 ft).				
	Camsell Formation				
19	Limestone (breccia): resistant; medium grey cliff-forming unit with a few recessive red intervals; rubble packbreccias as in underlying units; some thick, grey beds are nearly undisturbed; crackle breccia or mosaic breccia in place; beds occur at 4 m and at 148 m above the base of the unit; algal laminations in some grey beds; red, platy and silty clasts occur in the friable intervals with a reddish stained matrix.	178.0	(584.0)	1721.0	(5646.3)
18	Limestone (breccia): recessive; greyish red weathering; similar to Unit 16, but there are a few continuous and resistant grey beds in this unit.	74.0	(242.8)	1543.0	
17	Limestone (breccia): very resistant; light grey; cliff-former; very similar to Unit 15 but thick bedding is more distinct here and mosaic packbreccia is more common.	20.0	(65.6)	1469.0	
16	Limestone (breccia): recessive; reddish grey and red weathering with no preserved bedding; a rubble pack-breccia with abundant fragments of red, silty, thin bedded laminite (dedolomitized?); fragments up to 0.5 m but probably larger.	34.0	(111.6)	1449.0	
15	Limestone (breccia): very resistant; light grey cliff-former mottled orange and yellow; thick to very thick, indistinct but partly preserved bedding; a poorly sorted rubble; some mosaic packbreccia of grey, poorly sorted, recrystallized lime mudstones, with fragments up to 0.5 m across; finely fragmental matrix stained slightly orange; this unit is a prominent light grey marker cliff between recessive units.	38.0	(124.7)	1415.0	
14	Limestone (breccia): recessive; light grey and orange weathering unit that leads eastward to cliff; very poorly exposed (less than 10%) and vegetation covered; probably medium to thick bedding, perhaps somewhat thinner bedded than overlying unit; appears to be a rubble packbreccia with a recrystallized lime silt or mud matrix; subangular grey and reddish orange clasts with an abrupt lower contact with the underlying unit.	220.0	(721.8)	1377.0	
	Total thickness of the Camsell Formation is 564.0 m (1850.4 ft).				
	Vera Formation				
13	Limestone: argillaceous; recessive; vegetation covered brown weathering unit with 40 per cent outcrop; a very thin to thin planar to nodular bedded, argillaceous, skeletal wackestone with abundant brachiopods, trilobites and crinoids, particularly on bed surfaces; mottled yellow and grey but yellow and grey largely segregated in a striped pattern parallel to bedding; abrupt but conformable contact with underlying unit.	168.0	(551.2)	1157.0	(3795.9)
	Total thickness of the Vera Formation is 168.0 m (551.2 ft).				
	Root River Formation				
12	Dolostone: moderately resistant; dark to medium grey; very thick, planar to irregular bedded, vuggy biostromal sucrosic dolostone with vugs 10 to 15 cm across of trimerellid-type brachiopods?	38.0	(124.7)	989.0	(3244.8)
11	Dolostone: very resistant; cream coloured unit that forms prominent knobs down the ridge slope; biostromal, thick- to very thick-bedded sucrosic dolostone with abundant, large vugs of leached, robust brachiopods; some pyrite in vugs; a prominent gossan of weathered pyrite at 661 m; a slightly recessive interval at 222 m to 251 m of medium bedded, light grey, featureless sucrosic dolostone.	365.0	(1197.5)	951.0	
10	Dolostone: resistant; light grey to cream coloured cliff-former; medium- to thick-bedded, vuggy, light grey to white sucrosic dolostone; some recognizable silicified corals; uppermost 10 m of unit is medium dark, brownish-grey, crinoidal dolostone.	32.5	(106.6)	586.0	
9	Dolostone: resistant; dark grey cliff-former of dark greyish brown, sucrosic, thin to thick planar to irregular bedded dolostone with scattered crinoids and some lighter grey crinoidal turbidite beds; a few intervals of greenish yellow, argillaceous dolostone that display irregular corrosional and pyritized contacts with dark grey crinoidal dolostone; lighter grey, thicker bedded and more crinoidal towards the top of the unit; occasional vugs lined with pink dolomite.	76.0	(249.3)	553.5	
	Total thickness of the Root River Formation is 511.5 m (1678.1 ft).				
	Road River Formation				
8	Dolostone: silty; slightly recessive; bright orange marker bed that is slightly more resistant than the underlying unit; thinly laminated to laminated, platy, dark grey silty (fine sand?) dolostone that weathers bright orange (brick coloured); a prominent marker bed that may represent a thin tongue of the Cadillac Formation in the Road River Formation.	24.0	(78.7)	477.5	(1566.6)
7	Limestone: argillaceous; recessive; yellowish grey unit that leads up a slope east of a saddle; a laminated, platy argillaceous, yellowish grey, lime mudstone with some arthropod (eurypterid?) and fish fragments; a rhythmite, in part with scattered graded thin beds of crinoidal wackestone (turbidites?) separated by platy mudstones; this unit previously included in the Delorme Formation.	86.0	(282.2)	453.5	
6	Limestone: argillaceous; recessive; brownish grey to yellow weathering unit that leads down to a saddle; the lower 30 m is grey weathering, argillaceous, uniformly laminated, platy, medium grey lime mudstone				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	that becomes slightly thicker bedded and more resistant towards the top of the lower part; the upper subdivision more silty and brown weathering with interspersed, thin to medium beds of crinoidal lime wackestone that are weakly graded and may be turbidites; rhythmic bedding in the more resistant upper part of the upper subdivision; occasional brachiopods on bed surfaces (cf. *Spinetrypa* sp. at 283 m, GSC loc. C-83158); an abrupt but conformable lower contact; this unit was formerly included in the Delorme Formation.	132.0	(433.1)	367.5	
	Total thickness of the Road River Formation is 242.0 m (796.0 ft).				
	Whittaker Formation				
5	Dolostone: resistant; knob-forming unit of thin- to medium-bedded, dark brown, faintly laminated crinoidal dolostone; thicker beds are debris flows with reworked tabular clasts of dololaminite; some lighter coloured beds of dolomitized skeletal wackestone and packstone with abundant abraded crinoid and coral fragments and erosional basal contacts; these beds are probably debris flows or grain flows.	91.5	(300.2)	235.5	(772.6)
4	Limestone: recessive; medium grey weathering unit that forms a prominent bench leading down to a saddle poorly exposed and vegetation covered; thinly laminated and argillaceous, medium grey, platy lime mudstone.	40.0	(131.2)	144.0	
3	Dolostone: recessive; medium grey bench that is poorly exposed (40%); laminated and platy, containing thin sediment gravity flows of crinoids.	10.0	(32.8)	104.0	
2	Chert: dolomitic; resistant, but less resistant than underlying unit; only 40 per cent exposed; dark grey and dark reddish brown (rusty) weathering; laminated to very thin bedded, grey, ribbon chert containing some remnant dolomite.	45.0	(147.6)	94.0	
1	Dolostone: resistant; dark brownish grey unit that forms outcrop knobs on the highest part of a vegetation covered broad ridge; medium to thick planar to irregular bedded, dark brown (bituminous), crinoidal and coralline (colonial) dolostone that forms the knobs is interbedded with more recessive, thin-bedded intervals of dark crinoidal dolostone; fauna is silicified and black chert nodules are abundant, a little red ochre staining in bed partings.	49.0	(160.8)	49.0	
	Incomplete thickness of the Whittaker Formation is 235.5 m (772.6 ft).				
	Total thickness of the Pastel Creek Section is 2583.5 m (8476.0 ft).				

WHITTAKER 1 SECTION

SECTION 1A. This is an eastward-dipping section that begins at Lat. 62°31'30"N; Long. 124°47'W. It extends north and southeastward along the nose of a southeast-trending ridge in the Whittaker Range near Trench Lake in the east central part of the Root River map area (95K) in the District of Mackenzie, N.W.T. The section is best seen in RCAF air photo A13290-55. This section includes the contact of the Sunblood and Whittaker formations and the lower and middle parts of the Whittaker Formation. This section is part of a composite type section of the Whittaker Formation as defined by Douglas and Norris (1961, p. 7-8).

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Whittaker Formation				
9	Dolostone and chert: recessive; vegetation covered; dark grey bench-former of thin to very thin, planar bedded, dark grey dololaminite with some silvery grey, weathering grey, very thin bedded cherts, almost ribbon cherts. The upper part of the Whittaker Formation is not exposed.	45.0	(147.6)	640.5	(2101.4)
8	Dolostone: this unit forms a prominent, large, resistant knob in the ridge line which is nonetheless heavily vegetation covered with only scattered outcrops; dark brown (chocolate brown) with medium planar but irregular bedding with dark grey chert nodules parallel to bedding; scattered colonial corals (*Favosites* and *Halysites* or *Catenipora*) and crinoids; thinner bedded intervals tend to be covered; unit ends downslope at a prominent bench.	216.0	(708.7)	595.5	
7	Limestone: recessive; medium grey weathering; vegetation covered unit with discontinuous outcrop that extends southeastward from the uncovered dip slope of the previous unit and ends in a saddle; the lower 20.0 m is thin, planar to wavy smooth bedded; peletal lime wackestone and packstone with some crinoidal grainstone beds; the remainder is thin, lenticularly bedded, sparsely skeletal wackestone with scattered silicified colonial and solitary corals including *Bighornia*; some dark grey chert nodules parallel to bedding; this is the uppermost unit of the lower part of the Whittaker Formation.	108.0	(354.3)	379.5	
6	Sandstone: resistant; bright orange knob-former of thin- to thick-bedded grey, dolomite-cemented, coarse, quartzarenite sand with scattered quartz granules; abundant yellow dolomite mudflake and mudflake breccias at base of unit; sandstone becomes finer upward to yellow, thin bedded, silty dolostone at the top of the unit; this unit is a prominent marker bed in the lower part of the Whittaker Formation.	10.5	(34.5)	271.5	
5	Limestone: argillaceous; moderately recessive; brown weathering unit that begins at a less steeply inclined part of the ridge; 7.5 m of brown weathering, recessive, thin, lenticularly bedded medium grey, skeletal wackestone with abundant, yellow, argillaceous partings and mottlings forms the lower part of the unit with an abundant fauna of crinoids, *ramose* bryozoans, gastropods, trilobites and brachiopods concentrated in argillaceous pockets; 24.0 m of grey weathering, thin to medium, planar bedded lime wackestone with some silicified fauna including *Halysites* or *Catenipora* forms the less argillaceous, more resistant middle part of this unit, and 61.5 m of recessive, brown weathering, argillaceous, skeletal, lime wackestone similar to the lower part of the unit but with even more abundant brachiopods.	93.0	(305.1)	261.0	
4	Limestone: very resistant; main cliff-former of the lower part of the Whittaker Formation; six thick, dark grey cliffs of thin to medium planar and irregularly bedded, sparsely skeletal lime mudstone and wackestone with some thin, deep, red, argillaceous bed partings; these cliffs are separated by thin (5 to 10 m thick) intervals of medium grey, platy, lime mudstone; silicified *ramose* bryozoans and solitary corals common in thick cliffs; some large, machuritid-type gastropods and brachiopods. This unit passes northeastward over the main summit at 72 m and continues southeastward down the dip slope.	81.0	(265.8)	168.0	
3	Limestone: argillaceous; recessive; light grey unit, mainly scree with little outcrop apart from one more resistant, 6.0 m thick band 13.5 m above the base of the unit; thin- to medium- bedded lime mudstone with scattered pockets of yellow, argillaceous material and some stromatolites beneath the resistant band which is composed of thin, wavy bedded, dark grey, lime wackestone with burrow fillings and pockets of argillaceous material; brachiopods and ectoprect bryozoans abundant; the recessive slope above the resistant band is formed				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	of platy (very thin bedded to laminated), smooth bedded, yellow and grey lime mudstones with mudchip breccias and laterally linked hemispheroidal stromatolites; units 2 and 3 taken together constitute a greyish yellow weathering basal unit of the Whittaker Formation that is somewhat lighter in colour than the overlying dark grey Whittaker strata.	43.3	(142.7)	87.0	
2	Limestone: argillaceous; recessive unit that extends downward across a saddle; yellowish grey weathering with some resistant, dark brownish grey limestone bands; intervals of yellow, recessive platy lime mudstone and aphanocrystalline dolostone alternate with the resistant dark limestones; the base of the unit is marked by a resistant 4.5 m thick band of brownish grey, thin wavy to lenticularly bedded lime mudstone with abundant planolites type; limonitized burrows parallel to bedding and pockets of greenish and orange argillaceous material; abundant burrows and worm castings; lime mud lumps are common and may be reworked mud-flakes; a few small brachiopods, gastropods and trilobites; some lenses of coarse granule sand in more recessive, yellow weathering parts.	36.0	(118.1)	43.5	
	Incomplete thickness of the Whittaker Formation is 633.0 m (2076.8 ft).				
	Sunblood Formation				
1	Dolostone and limestone: recessive; bright orange weathering; medium and smooth planar bedded silty dolostone and lime mudstone; several solitary, rusty weathering medium sand beds that are finely rippled; this unit and underlying bright orange beds comprise the conspicuous orange weathering upper marker of the Sunblood Formation.	7.5	(24.6)	7.5	(24.6)
	Incomplete thickness of the Sunblood Formation 7.5 m (24.6 ft).				
	Total thickness of the Whittaker 1 Section is 640.5 m (2101.4 ft).				

WHITTAKER 2 SECTION

SECTION 2A. This is an eastward-dipping section that begins at Lat. 62°28'N; Long. 124°50'W and extends eastward along an eastward flowing stream in the central part of the Root River map area (95K) in the Northwest Territories. This section may be seen in RCAF air photo A17429-94. This sequence includes the middle and upper part of the Whittaker, the Road River, the Cadillac and the Vera formations and is the type section for the upper part of the Whittaker Formation.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Cadillac Formation				
14	Dolostone: argillaceous and silty; moderately resistant; yellowish orange and red weathering, 'rhythms' of yellow, platy, argillaceous and silty dolostone grading upward to red weathering, thin, planar bedded, dark grey dolostone; these rhythms are thicker (3 m thick) and more pronounced near the base of the unit; unit ends in a gradational contact with the nodular, brightly coloured, green and yellow, argillaceous, crinoidal, lime wackestone of the Vera Formation.	248.0	(813.6)	1243.5	(4079.7)
13	Dolostone: argillaceous and silty limestone; a resistant grey and yellow weathering unit with prominent limestone ribs; orange yellow, thin bedded to laminated argillaceous and silty, dark grey, calcareous dolostone with seven individual and compound, thick and very thick limestone debris flow deposits of crinoidal rubble floatbreccia; these deposits have a granular lime mud and sand matrix and the lime wackestone tabular fragments are ungraded or weakly graded; the lower, more recessive part of the unit contains medium bedded crinoidal and finely fragmental mass flow deposits.	61.5	(201.8)	995.5	
12	Dolostone: silty; moderately resistant; bright orange weathering, laminated platy to thin bedded, medium to dark grey dolostone; lower 30 m very planar bedded, bright orange weathering, calcareous dolostone; a middle recessive yellowish orange, platy dolostone interval and a slightly thicker bedded, silty, orange dolostone; the base of this unit is offset northward by 0.7 km from the line of section of the underlying units; gradational contact with underlying unit.	108.0	(354.3)	934.0	
11	Limestone and shale: slightly more resistant than underlying unit but is recessive in the upper part; light orange yellow weathering; more resistant lower part contains rhythms in which shaly beds grade upwards to thin, smooth, platy, lime mudstone beds; the upper more recessive part is predominantly silty shale that contains graptolites.	78.0	(255.9)	826.0	
	Total thickness of the Cadillac Formation is 493.5 m (1625.7 ft).				
	Road River Formation				
10	Limestone and shale: recessive; yellow weathering, thinly laminated, brown, silty lime mudstone and calcareous siltstone and shale as in Unit 9; some graptolites.	112.0	(367.5)	748.0	(2454.1)
9	Limestone and shale: slightly more resistant than the underlying unit; a yellow weathering, dark grey, argillaceous and silty, laminated to very thinly bedded lime mudstone and platy calcareous shale with some graptolites.	57.0	(187.0)	636.0	
8	Shale and limestone: recessive; light yellow unit of calcareous black shale and argillaceous platy lime mudstone with abundant mono-graptid graptolites; one bright yellow, resistant, very thin bedded lime mudstone rib in the middle of the unit.	68.5	(224.8)	579.0	
7	Limestone and shale: recessive compared to underlying Whittaker dolostone; the stream follows a broad valley through this unit; lower half of unit is composed of rib-forming rhythms several metres thick of laminated, platy, argillaceous yellowish grey, lime mudstone grading upwards to knobbly and nodularly, very thin bedded brownish grey, bioturbated lime mudstone and wackestone with orange, pink and green argillaceous partings and mottlings; the upper half of the unit is laminated, planar, platy, and silty yellowish grey, calcareous shale and argillaceous lime mudstone in less distinct rhythms; shales and platy limestones are graptolitic; this unit represents the uppermost unit of the Whittaker Formation as mapped by Douglas and Norris (1974); an abrupt but conformable lower contact.	161.5	(529.9)	510.5	
	Total thickness of the Road River Formation is 399.0 m (1309.1 ft).				
	Whittaker Formation				
6	Dolostone: resistant, dark grey unit; a thin, recessive, platy interval of argillaceous dark grey dolostone at the base passes upward to dark grey, cherty, thin to very thin, smooth, planar bedded dark grey dolostone with abundant chert nodules parallel to bedding.	47.5	(155.8)	349.0	(1145.0)
5	Dolostone: resistant; brownish grey weathering unit that lead to a bend in the creek; the lower 20 m is thin bedded, slightly cherty, dark brownish grey crinoidal dolostone; a middle, platy, argillaceous dark dolostone one metre thick and a				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	thick upper interval of dark grey "ribbon" chert and thin bedded, dark, brownish grey dolostone with abundant elongate chert nodules; scattered crinoids and several lenticular bodies of light grey crinoidal packstone that may represent sediment gravity flows, bedding passes upward from thin to medium bedding.	58.0	(190.3)	301.5	
4	Dolostone and shale: recessive; dark grey unit that forms a bend in the creek; very thin to laminated; smooth planar bedded; platy, argillaceous, dark brownish grey dolostone and black dolomite-cemented shale.	20.5	(67.3)	243.5	
3	Dolostone: resistant; dark brownish grey cliff-former of thin- to thick-bedded, dark grey, dolomitized crinoid wackestone; lower part thin to medium planar to irregularly bedded whereas upper part is thicker and more planar bedded and mottled; black chert nodules abundant near top of unit.	81.0	(265.8)	223.0	
2	Dolostone: recessive; light grey unit that forms a wide area in the creek; thin to medium planar to irregularly bedded, grey, slightly argillaceous dolostone containing some detrital skeletal material.	61.5	(201.8)	142.0	
1	Dolostone: very resistant; light- to medium-grey cliff-former that extends past the first large gorge in the creek; lower part is medium to thick planar bedded, medium grey, dolomitized skeletal wackestone and packstone with abraded crinoids and other skeletal fragments and rounded carbonate fragments less than 0.5 m (pellets-mud lumps?); upper part very thick, planar bedded, medium brownish grey coralline dolostone containing abundant fan-shaped arrays of silicified halysitid-like and other colonial corals; large quartz veins perpendicular to bedding.	80.5	(264.1)	80.5	
	Incomplete thickness of the Whittaker Formation is 349.0 m (1145.0 ft).				
	Total thickness of the Whittaker 2 Section is 1243.5 m (4079.7 ft).				

ESBATAOTTINE SECTION

SECTION 3A. This is a northeast-dipping section that begins at Lat. 61°43'N; Long. 125°36'W and extends northeastward across Esbataottine Mountain in the northwest part of the Virginia Falls map area (95F) in the Northwest Territories. The section is best seen in RCAF air photo A17441-74. It includes the type section of the Esbataottine Formation, and parts of the Sunblood and Whittaker formations.

Whittaker Formation

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
16	Dolostone: a resistant unit that forms the light grey brow of the hill; a thick bedded, dolomitized crinoid and intraclast packstone with abraded fragments, solitary and colonial rugose corals; some large crossbeds 0.5 m in amplitude; this unit may be a foreshore deposit, top of unit at brow of hill but 1.5 km northward down a dip slope is mainly medium grey, sparsely crinoidal and brachiopod-bearing (silicified), lime wackestone and dolostone with a few large favositid-type colonial corals; three 1 to 3 m thick, light grey, crossbedded, dolomitized, crinoidal, and intraclast packstone intervals punctuate this sequence.	11.0	(36.1)	396.0	(1292.7)
15	Dolostone: resistant; dark brownish grey cliff near summit of high point; base is marked by a slightly recessive (1.0 m thick) interval composed of several beds of light grey, dolomitized, crinoidal and intraclast packstone (or grainstone) in several weakly graded beds with faintly erosional bases; most of unit is dark to medium greyish brown; medium planar (slightly irregular) bedded; sucrosic dolostone with locally abundant silicified ramose colonial corals and solitary corals (*Bighornia*?) and amphiporids; unit becomes thinner bedded and crinoidal with black chert nodules towards the top.	26.0	(85.3)	385.0	
	Incomplete thickness of the Whittaker Formation is 37.0 m (121.4 ft).				

Esbataottine Formation

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
14	Limestone: argillaceous; recessive; brownish grey weathering unit that continues upslope and is slightly more resistant and less argillaceous than the underlying unit; thin to medium, slightly irregular, planar bedding, similar to underlying unit but less irregular; medium to dark grey lime mudstone with some crinoids and brachiopods that are locally abundant.	25.5	(83.7)	357.0	(1171.3)
13	Limestone: argillaceous; recessive; brown weathering unit; thin, lumpy and planar to lenticularly bedded, yellow mottled skeletal lime wackestone with brachiopods; some linear, yellow, argillaceous burrow fillings parallel to bedding that may follow an incipient polygonal mudcrack pattern; two solitary reddish orange, calcareous quartzarenite, fine to medium sandstone beds 0.7 m thick at 10.0 m and 18.0 m; these beds have erosional scoured basal contacts and contain chips of lime mudstone eroded from underlying beds.	33.0	(108.3)	331.5	
12	Limestone: silty; a light medium grey, very resistant cliff-former; thin to medium, planar, smooth bedded laminated lime mudstone; silt and fine sand forms the fine laminations; some small cut and fill structures where 10 to 15 cm of laminations have been truncated; some small isolated ripples and 'flaser'-like bedding with abundant ripples; units 9 to 12 form the most resistant part of the Esbataottine.	21.0	(68.9)	298.5	
11	Limestone: slightly recessive; medium to light grey unit between two cliff-formers; similar to Unit 9 with thin, irregular, yellow mottled, slightly argillaceous skeletal wackestone beds becoming very thin to top of unit with abundant silicified brachiopods, crinoids, bryozoans and trilobites; a solitary, smooth, medium planar bed of laminated light grey lime mudstone with flaser-like laminations and ripples outlined by silt and fine sand.	24.0	(78.7)	277.5	
10	Limestone: strongly resistant; medium grey cliff of dark grey crinoidal wackestone with silicified crinoids and abundant black chert nodules 10 to 20 cm long parallel to bedding; thick, planar to slightly wavy bedding; some curvilinear discontinuous partings, one band of silicified corals 3.0 m above the base of the unit, a very few scattered rhynchonellid-type brachiopods.	4.5	(14.8)	253.5	
9	Limestone: moderately resistant; medium grey weathering unit that forms small cliffs leading up to the large cliff of Unit 10; thin, irregularly and lenticularly bedded with yellow weathering, curvilinear argillaceous partings; a diverse brachiopod fauna, ectoproct bryozoans, trilobites, crinoids, gastropods and some small orthoconic cephalopods, skeletal material abraded and fragmented.	16.0	(52.5)	249.0	
8	Limestone and sandy dolostone: a light greyish yellow, recessive unit between two resistant units; thin, smooth to slightly irregular bedded lime mudstone with gastrods and ostracodes alternating with intervals of medium bedded, yellowish orange, sandy dolostone; some spectacular 15 cm wide sand-filled, mudcracked beds in orange dolostone at the top of the unit; this				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	unit forms a yellow weathering, recessive slope beneath the prominent cliffs of the overlying units.	49.0	(160.8)	233.0	
7	Limestone: resistant; medium grey, somewhat vegetation covered knob of thin, irregularly and lumpy bedded, skeletal lime wackestone; more pronounced, irregular and lumpy bedding higher in unit with discontinuous, yellow, argillaceous, bed partings; fauna of ectoproct bryozoans, brachiopods, trilobites, gastropods and trepostome bryozoans in solitary domal colonies up to 20 cm in diameter; a solitary, 0.7 m thick, orange bed of calcite cemented, quartzarenite medium sandstone overlies the basal contact with an erosional slightly scoured base.	50.5	165.7	184.0	
	Total thickness of the Esbataottine Formation is 223.5 m (733.3 ft).				
	Sunblood Formation				
6	Limestone and dolostone: this unit forms the resitant brow of the hill, and is a prominent light greyish yellow cliff; the basal contact of this cliff is marked by a recessive 25 cm thick interval of thin and lenticularly bedded (rippled) lime mudstone; thin to medium planar bedded lime mudstone that forms the lower part of the cliff passes upward to medium planar bedded, yellow and orange dolostone with lime mudclasts strung out parallel to bedding ("flaserite"); some of these mudclasts appear to have been considerably flattened by compaction.	10.5	(34.5)	133.5	(438.0)
5	Dolstone and limestone: lower, yellowish grey recessive part leads northward down a dip slope but the yellow upper part is more resistant and leads northward up a slope; thin to medium, planar bedded, medium grey, fossiliferous lime mudstone with some gastropods, ostracodes and other unidentified skeletal material grades upward to bright orange, medium smooth bedded dolostone that contains abundant lime mudclasts or lithoclasts (5 to 20 cm long) strung out parallel to bedding which in turn passes upward to medium smooth bedded, light yellow dolostone in the upper resistant part of the unit; silt and quartz sand seams and mudcracks are common in the dolostone and large pyrite cubes populate some bedding surfaces; thin entire unit appears to represent a shallowing upward peritidal cycle.	37.5	(123.0)	123.0	
4	Limestone: dolomitic; resistant, yellowish grey weathering unit that extends up the south side of a large knob; thin, planar bedded, grey lime mudstone with yellow argillaceous, silty and sandy bed partings in the lower part of the unit pass upwards to yellow, lumpy bedded, mottled beds with abundant, small mudcracks, scattered ostracodes and gastropods; one medium bed of light yellow or cream coloured dolostone in the centre of the unit.	25.5	(83.7)	85.5	
3	Limestone: resistant; dark grey weathering unit that forms small cliffs downslope to first wide saddle; thin, irregularly and lumpy (perhaps burrowed) but planar bedded intraclastic lime wackestone with thin discontinuous, pink, (some yellow) argillaceous bed partings that impart a mottled appearance to the bedding surfaces; in some places the thin, argillaceous bed partings are very discontinuous so that thick and very thick beds are formed between thin bedded more argillaceous intervals; gastropods and mudlumps contribute to the uneven bedding; some undetermined skeletal material.	18.0	(59.1)	60.0	
2	Limestone and dolostone: a moderately resistant and yellow and grey coloured banded unit that extends northward down dip slope; approximately a dozen cycles in which thin, planar bedded, slightly fossiliferous, medium grey lime mudstone grades upward to medium beds of yellow dolostone (aphanocrystalline) in 0.5 m thick couplets; some quartz-sand filled mudcracks (polygons 10-20 cm in diameter) in the dolostone beds, medium and coarse sand grains are well rounded; the lime mudstone beds are gently wavy with lumpy bedding surfaces formed of ovate algal 'blisters' several centimetres long and covered with ostracode shells; some brachiopod shells are strung out near the base of the lime mudstone beds where they rest on dolostone; some thick intervals of lime mudstone; in the transition zone between limestone and dolostone beds lime mud lumps (reworked mud flakes) are scattered throughout yellow dolostone that is faintly laminated; some discontinuous mudcracks in the lime mudstones are filled with gypsum.	22.5	(73.8)	42.0	
1	Limestone: argillaceous; resistant; yellowish orange and greyish orange weathering unit that ends in a gully north of summit; thin, irregular to nodular, discontinuous, lumpy bedding with orange and pink argillaceous bed partings; large orange burrows parallel to bedding and some indistinct mudcracks outlined by orange, argillaceous material; mainly orange mottled skeletal and intraclast (lime mud lumps <1 cm) wackestone with broken brachiopod and trilobite shell fragments; a solitary 0.73 m thick sandstone bed of yellowish grey, dolomite-cemented, impure quartz-arenite with some biotite, pyrite flecks and albite grains at 7.5 m.	19.5	(64.0)	19.5	
	Incomplete thickness of the Sunblood Formation is 133.5 m (438.0 ft).				
	Total thickness of the Esbataottine Section is 394.0 m (1292.7 ft).				

SUNBLOOD SECTION

SECTION 6A. This is a northeastward-dipping section that begins at Lat. 61°38'N; Long. 123°45'W and extends along a ridge line northeast and east from Sunblood Mountain near the South Nahanni River in the Virginia Falls map area (95F) in the Northwest Territories. This section may be seen in RCAF air photo A17440-18 and it includes the Esbataottine and Whittaker formations and parts of the Sunblood and Road River formations.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Road River Formation				
21	Limestone and shale: moderately resistant; yellowish grey unit that caps a low hill; red and yellow, silty, calcareous platy shale or platy argillaceous lime mudstone in 10 to 20 cm couplets with thin lime mudstone beds; sequence punctuated by thin to medium, graded turbidite beds of brachiopod wackestone.	37.0	(121.4)	507.0	(1663.4)
20	Limestone: slightly resistant; brownish grey, poorly exposed unit that leads upslope from saddle; the lower part of the unit is thin, nodularly to lenticularly bedded, yellowish grey, argillaceous skeletal wackestone with scattered brachiopods; this grades upward to thin to medium, uneven but continuously bedded, dark grey crinoidal wackestone with brillant pink wavy bed partings, some shell fragments on bedding surfaces.	42.0	(137.8)	470.0	
	Incomplete thickness of the Road River Formation is 79.0 m (259.2 ft).				
	Whittaker Formation				
19	Dolostone: moderately resistant; dark brown weathering unit that leads down a dip slope to a saddle;				

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	medium planar bedded, chocolate brown dolostone with dark grey chert nodules and silicified amphiporids and ramose colonial corals.	10.5	(34.5)	428.0	(1404.2)
18	Dolostone: thin, dark brownish grey unit of dark brown, faintly mottled dolostone with chert nodules and silicified amphiporids and solitary corals; this unit is a dark Whittaker-like band between less typical lighter grey strata.	5.0	(16.4)	417.5	
17	Dolostone: resistant; large knob of light grey, thick, planar and smooth bedded, finely crystalline dolostone with pervasive obvious and remarkably homogeneous fenestral fabric; one 2.0 m thick mottled brownish interval.	45.0	(147.6)	412.5	
16	Limestone and dolostone: moderately resistant but forms a dip slope down to saddle; limestone as in Unit 15 with 1.5 m thick sucrosic dolostone beds at 4.5, 11.0 and 20.0 m above the base of the unit.	27.0	(88.6)	367.5	
15	Limestone: resistant; medium grey weathering unit that forms the summit cliff; thin to medium, uneven, continuous bedding, crinoidal wackestone with abundant silicified solitary corals and ramose colonial (some *Favosites*-like corals) and rhynchonellid brachiopods.	30.0	(98.4)	340.5	
14	Dolostone: resistant; light greyish brown weathering lower part of the summit cliff; thin to medium, uneven bedded, light brown sucrosic dolostone with some solution-collapse breccia and white dolomite cement as in the underlying unit; abundant silicified ramose colonial corals.	18.0	(59.1)	310.5	
	Total thickness of the Whittaker Formation is 135.5 m (444.6 ft).				
	Esbataottine Formation				
13	Limestone and dolostone: moderately resistant; light orangish grey weathering unit that forms the upper slope extending upwards to summit cliff; thin bedded, fossiliferous lime mudstone with silicified brachiopods similar to Unit 12 but also beds and pods of pale orange weathering, replacement, sucrosic dolomite surrounding zones of solution-collapse breccia cemented by white dolomite (some zebra rock); dolomite most abundant at top and base of unit.	45.0	(147.6)	292.5	(959.6)
12	Limestone: moderately resistant; dark grey, smooth, vegetation covered slope with poor exposure (30% exposure); thin, uneven but continuous bedding; a dark grey (almost black and fetid) fossiliferous lime mudstone with scattered brachiopods, crinoids.	43.5	(142.7)	247.5	
11	Limestone: sandy; resistant; cliff-forming greyish orange unit; a 1.0 m thick orange weathering, calcite-cemented, quartzarenite, medium sandstone at the base is overlain by thin to medium, smooth planar bedded, medium grey, lime mudstone with sparsely scattered coral fragments; another orange dolomitic sandstone bed 4.5 m above the base of the unit overlain by platy, thin bedded, lime mudstone at top with silty laminae.	9.0	(29.5)	204.0	
10	Limestone: dark grey and resistant, 6 m of dark grey, prominent cliff and bench; thin to medium planar to wavy bedded, dark grey, crinoidal wackestone with black chert nodules and silicified solitary and colonial corals (along 2 zones) overlain by less resistant, thinner bedded, crinoidal wackestone with only scattered corals.	21.0	(68.9)	195.0	
9	Limestone: argillaceous; moderately resistant; yellowish grey weathering unit that forms the first resistant cliff and bench leading upslope; thin, lumpy to nodularly bedded, argillaceous skeletal wackestone that becomes more even bedded and resistant higher in the unit; grey with greenish yellow, argillaceous mottles and partings; moderately abundant brachiopods (including *Mimella*) and ectoproct bryozoans.	15.0	(49.2)	174.0	
8	Limestone: silty, dolomitic; recessive; yellowish brown to orangish yellow weathering unit that extends across a saddle; the lower half of the unit is thin, lumpy to nodularly bedded, greyish green, argillaceous, skeletal, lime wackestone with brachiopods and trilobites; the upper half is yellowish orange, thin (platy) to medium smooth and planar bedded, silty dolomitic lime mudstone; polygonal mudcracks common and locally ostracodes abundant on bed surfaces.	12.0	(39.4)	159.0	
7	Limestone: resistant; dark grey unit that forms a well exposed cliff at the brow of a hill but is poorly exposed (30% exposure) where it extends northward beyond the summit and down the dip slope to a saddle; the lower 12.0 m interval of cliff-forming beds are thin to medium, planar to wavy bedded, dark grey, lime mudstone that is locally fossiliferous; pink ferruginous and argillaceous partings that may be hardgrounds in places; ferruginous (and silicified?) hash pavements of trilobite, (*Cereurus*?) ectoproct bryozoan and sparse brachiopod fragments along some partings; upper part of unit is more unevenly bedded with yellowish brown partings and large *Planolites*-type burrows.	27.0	(88.6)	147.0	
6	Limestone: argillaceous; recessive; thin bedded; argillaceous, skeletal wackestone but uneven, continuous bedding rather than the lumpy, nodular bedding of the underlying unit; greenish yellow and pink argillaceous partings; rhynchonellid-type brachiopods abundant locally, some crinoids and trilobites; an orange marker bed of sandy, dark grey mudstone caps the unit; ripples in sandy bed have a 5 cm wavelength.	22.5	(73.8)	120.0	
5	Limestone: argillaceous; recessive; brownish grey lower part becoming more resistant higher upslope; grey weathering unit leads part way up hill to the first bench on the side of the hill; grey, thin to medium, lenticularly bedded, sparsely fossiliferous lime and mudstone grades upward to thin, lumpy, nodularly bedded, greenish yellow, mottled grey, argillaceous, skeletal wackestone with a diverse fauna of brachiopods (including *Mimella*), trilobites, gastropods and bryozoans (ectoproct and stony domal bryozoans) and abundant crinoids; argillaceous bed partings, slightly pyritized and limonitic bed surfaces.	31.5	(103.3)	97.5	
	Total thickness of the Esbataottine Formation is 226.5 m (743.1 ft).				
	Sunblood Formation				
4	Dolostone and limestone: resistant; yellowish orange weathering unit that extends northward across a broad knob and down to the broad saddle that straddles the Sunblood-Esbataottine contact; well exposed but mainly broken outcrop; cycles of yellow mottled, thin, lumpy bedded, slightly argillaceous and bioturbated, skeletal, grey lime wackestone and lime mudstone grading upwards to yellow, thin- to medium-bedded dolostone with grey lime mudclasts strung out parallel to bedding (flaserite); some shell pavements of ectoproct bryozoans, gastropods, brachiopods, crinoids and ostracodes (ferruginous hardgrounds); some recessive, orange weathering, silty dark grey lime mudstones with thin to medium smooth beds (This unit may correlate with units 5 and 6 of Section 3A).	24.0	(78.7)	66.0	(216.5)

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
3	Dolostone and silty limestone: a slightly resistant, orange bench-former on the north side of the saddle, a thin, uneven bedded, orange weathering, dark grey silty skeletal lime wackestone with abundant brachiopods including *Orthambonites*?	7.5	(24.6)	42.0	
2	Limestone and silty limestone: a poorly exposed (30% exposure), orange weathering unit that forms a recessive broad saddle; a 2 m thick exposure of thick, planar bedded, light grey to white, pelletal and intraclastic lime packstone? with fenestral fabric marks the base of the unit, but most of the unit is thin, uneven to lenticularly bedded, dark grey, silty lime mudstone with orange partings and scattered brachiopods.	13.5	(44.3)	34.5	
1	Limestone and dolostone: units 1 to 4 comprise the resistant, orange weathering upper marker of the Sunblood Formation (Douglas and Norris, 1960); Unit 1 forms the brow of Sunblood Mountain leading up to the summit cairn; two yellowish orange weathering, limestone-dolostone cycles in which thin, irregularly or lumpy (nodular) bedded, slightly fossiliferous lime mudstone grades upward to yellow, thin to medium, smooth planar bedded dolostone 'flaserite' in which grey lime mudclasts up to 20 cm long are strung out parallel to bedding within a faintly laminated, yellow, aphanocrystalline dolostone and finally to resistant mudcracked (20 cm polygons) yellowish orange dolostone.	21.0	(68.9)	21.0	
	Incomplete thickness of the Sunblood Formation is 66.0 m (216.5 ft).				
	Total thickness of the Sunblood Section is 507.0 m (1663.4 ft).				

THIRD CANYON SECTION

SECTION 5A. This is a nearly horizontal section that extends southward along a northward-trending ridge line in the centre of Virginia Falls map area (95F). The section begins at Lat. 61°22'30"N; Long. 125°57'30"W and is well shown in RCAF air photo A17123-64. It includes parts of the Sunblood and Whittaker formations.

Unit	Description	Unit Thickness metres	(ft)	Total from base metres	(ft)
	Whittaker Formation				
9	Dolostone: resistant; dark brownish grey, cliff-forming unit that forms the ridge top; dark brownish grey, medium planar bedded dolostone with abundant, black, chert nodules streaking out parallel to bedding; this unit is probably near the top of the Whittaker.	25.5	(83.7)	154.5	(506.9)
8	Dolostone: silty; a very recessive unit of dark grey, platy, very thin bedded to laminated, silty dolostone; virtually no solid outcrop.	3.0	(9.8)	129.0	
7	Dolostone and sandstone: similar to underlying unit but several individual dolostone beds are interbedded in the lower part of this unit; unit capped by sandstone containing large sand waves 1 to 2 m in amplitude with some granule-size grains.	9.0	(29.5)	126.0	
6	Sandstone and dolostone: resistant; white weathering; 7.0 m of thick, planar but uneven bedded, light greyish brown, crinoidal dolostone abruptly overlain by 5.0 m of massive, white weathering, very light brown, dolomite-cemented, quartzarenite fine sandstone; sandstone rests with a sharp but very irregular contact on the dolostone.	12.0	(39.4)	117.0	
5	Sandstone: resistant cliff-former; rusty orange at base but white in upper part; thin bedded, bioturbated, dolomite-cemented fine sandstone at base grades upward to medium, thick- and very thick-bedded white and light orange, medium to coarse quartzarenite sandstone; some trough crossbedding with rusty brown, micaceous partings up to 1 m in amplitude and some ripple drift bedding, some granule gravel conglomerates at the bases of some crossbedded intervals comprise mainly of quartz pebbles but with some orange dolostone pebbles from the underlying Sunblood Formation.	25.5	(83.7)	105.0	
4	Sandstone: slightly resistant; rusty orange weathering unit that forms a swell in the ridge line; thin to medium, continuous lumpy bedding; argillaceous dolomite-cemented impure quartzarenite fine to medium sandstone that is strongly bioturbated; abundant, small burrow-fillings parallel to bedding; lower contact not observed.	22.5	(73.8)	79.5	
3	Siltstone and silty dolostone: dolomitic; recessive and bright orange weathering; thin smooth, lenticular rippled bedding; a dark grey, silty dolostone and dolomite-cemented quartzarenite siltstone; no fauna.	15.0	(49.2)	57.0	
	Incomplete thickness of the Whittaker Formation is 112.5 m (369.1 ft).				
	Sunblood Formation				
2	Dolostone: very resistant; orange weathering unit that forms a large cliff and bench; thin to medium, smooth planar bedded, yellow and orange aphanocrystalline dolostone; some intervals with abundant, rounded and compressed grey lime mudlumps in faintly laminated dolostone (carbonate flaserite); unit capped by a medium bed of dolomitized, argillaceous, skeletal wackestone with brachiopods, crinoids, corals (some favositid-type corals) and *Receptaculites*.	21.0	(68.9)	42.0	(137.8)
1	Dolostone: resistant; rusty orange weathering unit that forms small cliffs on a slope leading up to a major bench; thick, planar bedded, greyish brown mottled orange, finely crystalline dolostone with abundant, discontinuous, irregular yellowish orange partings; this unit appears to be the dolomitized equivalent of the thin, lumpy bedded, argillaceous, yellow mottled, grey, skeletal wackestones of the Sunblood Formation in Section 4A, but the thin nodular beds have been melded together by dolomitization to form thick beds and dolomitization appears to have more uniformly disseminated the orange colour throughout the rock.	21.0	(68.9)	21.0	
	Incomplete thickness of the Sunblood Formation is 42.0 m (137.8 ft).				
	Total thickness of the Third Canyon Section is 154.5 m (506.9 ft).				

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